

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES	
2. AMENDMENT/MODIFICATION NO.		3. EFFECTIVE DATE		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. <i>(If applicable)</i>	
6. ISSUED BY		CODE		7. ADMINISTERED BY <i>(If other than Item 6)</i>		CODE	
8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>				(X)		9A. AMENDMENT OF SOLICITATION NO.	
						9B. DATED <i>(SEE ITEM 11)</i>	
						10A. MODIFICATION OF CONTRACT/ORDER NO.	
						10B. DATED <i>(SEE ITEM 11)</i>	
CODE		FACILITY CODE					

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers
☐ is extended, ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. **FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER.** If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

**13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

CHECK ONE	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copy to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>		16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>	
15B. CONTRACTOR/OFFEROR		16B. UNITED STATES OF AMERICA	
15C. DATE SIGNED		16C. DATE SIGNED	
<div style="border-top: 1px solid black; width: 100%;"></div> <i>(Signature of person authorized to sign)</i>		<div style="border-top: 1px solid black; width: 100%;"></div> <i>(Signature of Contracting Officer)</i>	

Item 14. Continued.

CHANGES BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT

1. Price Proposal Schedule - Replace the Price Proposal Schedule with the accompanying new Price Proposal Schedule, bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0013."
2. Replacement Sections – Replace the following sections with the attached new sections of the same number and title, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0013."

SECTION 00110	PROPOSAL SUBMISSION REQUIREMENTS AND INSTRUCTIONS
SECTION 00120	PROPOSAL EVALUATION AND CONTRACT AWARD

CHANGES TO SPECIFICATIONS

3. Replacement Sections – Replace the following sections with the accompanying new sections of the same number and title, each bearing the notation "ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0013:"

SECTION 01001	STATEMENT OF WORK
SECTION 01015	DESIGN REQUIREMENTS AFTER AWARD
SECTION 01016	DESIGN DOCUMENT REQUIREMENTS
SECTION 01500	TEMPORARY CONSTRUCTION FACILITIES
SECTION 15741	VERTICAL GROUND-COUPLED HEAT EXCHANGE SYSTEMS (VGCHES)

END OF AMENDMENT

PRICE PROPOSAL SCHEDULE
 (To be attached to SF 1442)

Design/Build, Army Family Housing, Harris Heights
Fort Sam Houston, Texas

BASE BID: All work required by the Contract documents for the design and construction of the Ft Sam Houston Harris Heights Family Housing exclusive of work required by Option Bid Items.

Item No.	Description	Quantity	Unit	Unit Price	Amount
0001	Total cost for complete design and construction of Army Family Housing, Harris Heights, including interior Gas service, and all site improvements within the Building 1524mm (5 feet) lines, Except for separately price bid items	Job	Sum	***	\$ _____
0002	Total cost for Construction of all site improvements (outside the Building 1524 mm (5 feet) line) for Family Housing Units, including grading, paving, utilities, storm drainage system, curbs and gutters, sidewalks, recreation facilities, tot lots, bus stop shelters, bike paths, landscaping, irrigation, exterior lighting, fencing, all other work not separately listed.	Job	Sum	***	\$ _____
(AM#3)					
0003	<u>Total Cost for City Public Service (CPS) to design and construct the Gas Distribution System up to and including the meter, outside the Building 1524 mm (5 feet) line.</u>	Job	Sum	***	\$ <u>150,000</u>

PRICE PROPOSAL SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Amount
(AM#5)					
0004	<u>Total Cost for Southwestern Bell Telephone Company (SWB) to design and construct the exterior telephone system.</u>	Job	Sum	***	\$ <u>35,000</u>
0005	Final Record Drawings	Job	Sum	***	\$ <u>50,000</u>

TOTAL BASE BID \$ _____

0006 OPTION NO. 1:

Additional or Deductive cost for all work required by the plans and specifications to Design and Construct Ground Coupled Heat Pumps in lieu of Gas Distribution.*

TOTAL OPTION NO. 1 \$ _____

*Note: Deductive amounts should be denoted by a negative sign (-), parentheses, or brackets.

TOTAL BID (BASE BID PLUS OPTION NO. 1) \$ _____

0007 The monetary value for warranty work is established at 1 percent of the amount awarded for construction. See the Contract Specifications Section 01770 CONTRACT CLOSEOUT, paragraph "Contractor's Response to Construction Warranty Service Requirements." (AM#2)

PROJECT COMPLETION TIME:

0008 Completion Time for all work (NOT to exceed the maximum time stated in Section 01000 DESIGN AND CONSTRUCTION SCHEDULE)

PROJECT COMPLETION TIME: _____ Calendar days from NTP

PRICE PROPOSAL SCHEDULE

NOTES:

1. ARITHMETIC DISCREPANCIES (EFARS 14.407-2)

(a) For the purpose of initial evaluation of bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the bidding schedule as submitted by bidders:

- (1) Obviously misplaced decimal points will be corrected;
- (2) In case of discrepancy between unit price and extended price, the unit price will govern;
- (3) Apparent errors in extension of unit prices will be corrected; and
- (4) Apparent errors in addition of lump-sum and extended prices will be corrected.

(b) For the purpose of bid evaluation, the Government will proceed on the assumption that the bidder intends his bid to be evaluated on the basis of the unit prices, the totals arrived at by resolution of arithmetic discrepancies as provided above and the bid will be so reflected on the abstract of bids.

(c) These correction procedures shall not be used to resolve any ambiguity concerning which bid is low.

2. If a modification to a bid based on unit prices is submitted, which provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price in the bid schedule must be stated. If it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every unit price in the bid schedule.

3. Bidders must bid on all items.

4. Failure to insert prices for each item in the Bidding Schedule may cause the proposal to be rejected.

5. Costs attributable to Division 01 - General Requirements are assumed to be prorated among bid items listed.

6. Responders are advised that this requirement may be delayed, cancelled or revised at any time during the solicitation, selection, evaluation, negotiation and/or final award process based on decisions related to DOD changes in force structure and disposition of the Armed Forces.

7. EXERCISE OF OPTIONS (SWDR 715-1-1 (16 January 1996))

The Government reserves the right to exercise the option(s) by written notice to the Contractor either singularly or in any combination for up to 90 calendar days after award of the Base Bid without an increase in the Offeror's Bid Price. Completion of added items shall continue at the same schedule as the Base Bid unless otherwise noted in Section 01000 DESIGN AND CONSTRUCTION SCHEDULE, paragraph 1 entitled SCHEDULE.

PRICE PROPOSAL SCHEDULE

NOTES: (cont)

8. The Army will procure this housing through a design and cost competition in accordance with the provisions set forth in this Request for Proposals (RFP). When a contract is awarded, it will be a "Firm Fixed Price Contract."

9. The Congress, in authorizing and funding this contract, has established certain cost limitations for the project. The current authorization for the complete design and construction of this project is **\$10,000,000.00**. Proposals that exceed this funding limit after exercising any options may be rejected. Submission of desirable alternative features exceeding minimum requirements may be considered as long as award can be made within the established funds.

10. Any proposal which is materially unbalanced as to prices for the Base Schedule may be rejected. An unbalanced proposal is one which is based on prices significantly less than the cost for some work and prices which are significantly overstated for other work and can also exist where only overpricing or underpricing exists.

11. **BID ITEM 0003**

The Contractor shall be responsible for reimbursing the San Antonio City Public Services (CPS) for their costs in constructing the city services tie-in. This figure will be adjusted up or down to match the actual costs prior to Government payment of this bid item. (AM#3)

12. **BID ITEM 0004**

The Contractor shall be responsible for reimbursing Southwestern Bell for their costs in constructing the exterior telephone system. This figure will be adjusted up or down to match the actual costs prior to Government payment of this bid item. (AM#5)

END OF PROPOSAL SCHEDULE

SECTION 00110
PROPOSAL SUBMISSION REQUIREMENTS AND INSTRUCTIONS

1. GENERAL PROPOSAL INFORMATION.

a. General.

(1) Inasmuch as the proposal will describe the capability of the offeror to perform any resultant contract, as well as describe the understanding of the requirement of the Statement of Work, it should be specific and complete in every detail. The proposal should be prepared simply and economically, providing straight-forward, concise delineation of capabilities to perform satisfactorily the contract being sought. The proposal should therefore be practical, legible, clear and coherent. Mail or deliver the proposal to the address listed on the Standard Form 1442, "Solicitation, Offer and Award."

(2) Through the use of a single phase procurement process, the Department of the Army desires to obtain the design and construction of Army Family Housing, Fort Sam Houston. In this procurement procedure, consideration will be given to Offeror Performance Capability and Technical/Design, Proposal and Schedule. Final selection and basis for award of the Design/Build Contract will be on the basis of qualifications, technical quality, price, and other salient factors considered to be in the Government's best interests. If awarded the Contract, the offeror shall complete the design and construction documents and construct the project in compliance with these requirements.

b. Unnecessarily Elaborate Proposals.

Unnecessarily elaborate brochures or other presentations beyond those sufficient to present a complete and effective response to this solicitation are not desired and may be construed as an indication of the offeror's lack of cost consciousness. Elaborate artwork, expensive paper and bindings, and expensive visual and other presentation aids are neither necessary nor wanted.

c. Explanation to Prospective Offerors.

Any prospective offeror desiring an explanation or interpretation of the solicitation, drawing, specifications, etc. must request in writing and shall be directed to the individuals listed in Section 00100 INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS, soon enough to allow a reply to reach all prospective offerors before the submission of their proposals. Oral explanation or instructions given before award of a contract will not be binding. Any information given a prospective offeror concerning a solicitation will be furnished promptly to all other prospective offerors as an amendment to the solicitation, if that information is necessary for submitting proposals, or if the lack of it would be prejudicial to other prospective offerors.

d. Required Technical Data for Proposal Submission.

Offerors are advised that the required data will be utilized for review and evaluation and used for determination of a "Quality Rating" by a Technical Evaluation Board and that all data submitted for consideration under this proposal will be reviewed only for the purposes required for evaluation and award. The Government will not make assumptions concerning the offeror's intent, capabilities, facilities, or experiences. Clear identification is the sole responsibility of the offeror.

2. GENERAL PROPOSAL SUBMISSION INSTRUCTIONS

a. Who May Submit.

(1) Proposals may be submitted by: firms formally organized as design/build entities, or by design firms and construction contractors that have associated specifically for this project. In the latter case, a single design firm or construction contractor may offer more than one proposal by entering into more than one such association. For the purpose of this solicitation, no distinction is made between formally organized design/build entities and project-specific design/build associations. Both are referred to as the design/build offeror, (or simply "offeror"), or the design/build contractor, (or simply "Contractor"), after award of a contract.

(2) Any legally organized offeror may submit a proposal, provided that the offeror, or offeror's subcontractor, has on its permanent staff professional architects and engineers registered in the appropriate technical disciplines and provided that the requirements specified in the solicitation are met. All designs must be accomplished under the direct supervision of appropriately licensed professionals.

b. Where to Submit. Offerors shall submit their proposal packages to the USACE Fort Worth District at the address shown in Block 8 of Standard Form 1442.

c. Submission Deadline. Proposals shall be received by the USACE Fort Worth District no later than the time and date specified in Block 13 of Standard Form 1442.

d. Proposal Requirements and Submission Format. The proposals sought by this solicitation shall be arranged to present information in three general areas, Offeror Performance Capability, Technical Solution and Contractual/Financial Information.

(1) Requirement for Special Marking of Proposal Data Envelopes or other cover for material submitted in response to this RFP shall be opaque, and must be so presented that they may easily be identified. At a minimum, the outside cover must show:

Destination of Proposal
Name and location of project as described in the RFP documents
Solicitation number
Name and address of offeror
Volume number

(2) Proposal Submission The proposal submitted shall include an original and copies as indicated below. Submit the proposal in the formant specified. **Oral or telephonic proposals will not be considered** Each proposal shall be marked to clearly identify the original and the copies. The copies shall be numbered.

Volume I	Performance Capability	Original and nine (9) copies
Volume II	Technical/Design	Original and nine (9) copies
Volume III	Pro Forma	Original and two (2) copies

(3) Format In order to effectively and equitably evaluate all proposals, the Contracting Officer must receive information sufficiently detailed to allow review and evaluation by the Government.

a. Written Material

(1) All written material, including catalog cuts, shall be submitted in standard three ring loose-leaf binders. Proposals shall be tabbed and labeled in a manner to afford easy identification from a Table of Contents. Font size shall be not less than 10 point. Each page shall be identified with the appropriate page number centered at the bottom of the page. Sheet size of the proposal contents shall be 8 ½ by 11 inches. 11 by 17 inch sheets will be

ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0013

allowed for charts and tables but will be counted as 2 single-sided or 4 double-sided pages. Proposal length shall be limited to 70 single-sided or 35 double-sided pages, exclusive of the cover sheet and table of contents, and appendices. Legibility, clarity, coherence, and the contents are important. The offeror shall not submit verbatim sections or attachments of this solicitation as part of their proposal. Offers that do not meet these requirements may be subject to rejection.

- (2) A cover sheet identifying the offeror and the project shall be provided. The second sheet shall be a Table of Contents.
- (3) Table of Contents. The proposal shall contain a detailed Table of Contents. The complete Table of Contents shall be included in each binder used.
- (4) Materials submitted but not required by this solicitation (such as company brochures and equipment lists) shall be relegated to appendices.
- (5) Proposal revisions for written portions of the proposal, including catalog cuts and specifications, shall be submitted as page replacements with revised text readily identifiable, e.g. **bold face print** or underlined. The source of the revision, e.g. Error, Omission, or Clarification (EOC), amendment or other Contractor-initiated change, shall also be indicated for each revision. Revised pages shall be numbered, dated, submitted in same number of copies as the original proposal submittal, and a different color page than the original

b. Drawings

- (1) Full size drawings shall be submitted in accordance with Section 1016, DESIGN DOCUMENT REQUIREMENTS. Each drawing shall be identified with the appropriate Sequence and Sheet Numbers in the lower right hand corner. The original and two (2) copies of all drawings must be full size drawings (A-1 (841 x 594 mm (metric), 33.1 x 23.4 inches (English)). Submit an original and nine (9) copies of all half size drawings, (A-3 420 x 297 mm (metric), 16.5 x 11.7 inches English).
- (2) Proposal revisions for drawings shall be submitted as sheet replacements with all changes identified on the drawings with clouds and in the title block, including the source of the revision, e.g. Error, Omission, or Clarification (EOC), amendment or other Contractor-initiated change. Revised drawings shall be numbered, dated and submitted in the same number of copies as the original proposal submittal.
- (3) Drawings shall be formatted in accordance with Section 1016, Paragraph “.CAL Files.” The offeror must ensure that all textual material, if it has been scanned, has been converted to a text searchable document by using the Paper Capture tool in Adobe Acrobat.

c. Electronic Material

One electronic copy on CD-ROM of Volume I (Offeror Performance Capability Information) and Volume II (Technical Proposal and Drawings) is to be submitted no later than the third day after the proposal due date, 4:00 p.m. Central Daylight Savings Time. If any discrepancies between the originally submitted proposal and the CD-ROM version are found, the originally submitted proposal will take precedence over the CD-ROM version. All textual material, catalog cuts, and other materials which do not constitute proposal drawings or plans shall be in Adobe Acrobat Portable Document Format (.pdf), arranged in the same order as the hard copy version with each section or part book marked. All drawings shall be formatted in accordance with Section 1016, Paragraph “.CAL Files.” The offeror must ensure that all textual material, if it has been scanned, has been converted to a text searchable document by using the Paper Capture tool in Adobe Acrobat.

If after receipt of initial proposals it is determined that discussions are necessary at the discretion of the Government, a CD-ROM may be requested for the revised proposal.

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d. Restrictions

Incomplete proposals. Failure to submit all the data indicated in this section may be cause for determining a proposal incomplete and, therefore, not considered for technical evaluation ~~in Phase 2~~, or for subsequent award.

3. OFFEROR PERFORMANCE CAPABILITY INFORMATION PROPOSAL SUBMISSION INSTRUCTIONS (Volume I):

(1) **Offeror Past Performance Information.** Included in this section is a sample Past Performance Evaluation Questionnaire. The offeror shall identify the three completed projects to be used for reference and evaluation purposes. Provide a questionnaire to the Point of Contact for each completed project listed. When completed, these forms shall be mailed, faxed, or e-mailed to the USACE Fort Worth District Contract Specialist identified in the sample transmittal letter provided. Failure of a reference verification to arrive at the USACE Fort Worth District within the identified time period shall adversely affect the overall rating received. It is the contractor's responsibility to ensure that the reference documentation is provided, the Government WILL NOT make additional requests for past performance information or references. Copies of the evaluation form SHALL NOT be provided to the Offeror from the reference. Projects from which questionnaires are received shall have been completed within three years of the date of this solicitation.

(2) **Project Key Personnel.** Provide the names, resumes, and levels of responsibility of the principal managers and technical personnel who will be directly responsible for the day-to-day design and construction activities. Include, as a minimum, the project manager; the project architect; the engineers responsible for civil, electrical, mechanical and structural design; the quality control manager; and the construction manager. Indicate whether each individual has had a significant part in any of the project examples cited. If reassignment of personnel is considered possible, provide the names and resumes of the alternative professionals in each assignment. Project key personnel shall include the key construction subcontractors and the extent of their role with respect to the design phases of this project. Key subcontractors shall include, but are not limited to: Structural Ironworkers, Masonry Works, Electrical, Mechanical, and Site Development subcontractors.

(3) **Technical Approach Narrative.** Describe in general terms how the Offeror will approach the design and construction of these facilities. The narrative should include considerations of "Fast Track" construction whereby preliminary site construction activities can begin prior to 100% completion of the design documents. The roles and responsibilities of the various sub-contractors for both design and construction shall also be addressed. Include in the narrative the offeror's proposed processes for handling field problems and assuring Designer of Record involvement throughout the construction period. Technical Approach Narrative shall be limited to a maximum of five (5) typewritten pages.

(4) **Offeror Relevant Experience.** Provide examples (at least three) of projects for which the offeror has been responsible. The examples should be as similar as possible to this solicitation in project type and scope. Provide references (with contact names and telephone numbers) for all examples cited. Each example shall indicate the general character, scope, location, cost, and date of completion of the project. If the offeror represents the combining of two or more companies for the purpose of this RFP, each company shall list project examples. Example projects must have been completed not later than three years from the date of this solicitation.

(5) **Project Management Plans and Schedules.** The offeror shall provide a Management Plan. This is an overall plan showing how the offeror will control the job. The term "management plan" is defined as a plan that includes the following sub plans: Quality Control Plan; Design and Construction Schedule; Contract Closeout Plan; and Utilization of Disadvantaged Business.

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a) Quality Control Narrative.

The Quality Control **Narrative** is part of the Management Plan. Although the Government will provide an on-site representative during construction, **contract awardee** is expected to develop a formal program of monitoring to ensure a high level of construction quality. **As part of this proposal submittal, Offerors shall submit a Quality Control Narrative** that responds to the **intent of Technical Specifications Section 01430 Design Quality Control and Technical Specifications Section 01451** entitled "Contractor Quality Control (furnished with this RFP package) **As a minimum, the offeror's narrative** shall include the following characteristics:

CONTRACTOR QUALITY CONTROL REQUIREMENTS	
A clear identification of the personnel responsible for quality control and a clear policy establishing their authority.	
description of the tasks and functions of the quality control personnel.	
Policy establishing schedules for the performance of quality control tasks.	
Policy and procedure for reporting quality control findings to the Contracting Officer.	
A procedure whereby the Contracting Officer may resolve disputes that have not received satisfactory responses from the first levels of quality control personnel.	
The plan for review, evaluation, and Offeror Quality Control of the Design Submittals prior to Government receipt.	
The plan for review of submittals and extensions of design. Of particular interest is the role of the Designer of Record in all design and construction progress.	
Procedures for involving Key Subcontractors in the design development.	

(b) Design and Construction Schedule

An Integrated Design and Construction Schedule with all "Fast Tracking" areas clearly identified. The offeror shall also submit a rationale explaining how the schedules will be achieved. The schedule for design and construction shall be task oriented, indicating dates by which milestones are to achieved. The offeror may use a critical path or other method of choice; however, the schedules shall be graphically represented.

(c) Contract Closeout Plan.

A Closeout Plan shall be furnished in a brief structured time scale schedule reflecting the planned activities during the final 90 days of the contract activity. Items to be included are as follows:

CLOSEOUT PLAN	
Testing of equipment and systems with schedules and reports.	
Equipment instruction and training schedules.	
O&M Manuals transfer.	
As-built drawings transfer.	
Transfer procedures and schedules.	

CLOSEOUT PLAN

Pre-final inspection procedures and correction of deficiencies.
Warranty data submission and planned implementation.
Cleanup of administrative deficiencies.
Move off site.

(d) Small Disadvantaged Business (SDB) Utilization Plan

*******Note: This item shall be submitted in Volume III (Pro Forma) *******

ALL Offerors shall submit an SDB Utilization Plan, to include the following information:

- ?? Identification of each SDB concern proposed and the work each is to perform(See NOTE below regarding SDB certification)
- ?? Targets expressed in dollars and percentages representing each SDB concern's participation of the total contract value.
- ?? Total target value of all SDB participation, expressed in dollars and percentages, of the total contract value.

The offeror is put on notice that any targets represented in a submitted proposal will be incorporated into and become part of any resulting contract.

NOTE: All proposed SDB concerns must be SBA-certified in PRO-Net. SBA concerns can register in PRO-Net on the Internet at the following address: <http://pronet.sba.gov>.

**SAMPLE TRANSMITTAL LETTER
AND
PAST PERFORMANCE EVALUATION QUESTIONNAIRE**

Date: _____

To: _____

We have listed your firm as a reference for work we have performed for you as listed below. Our firm has submitted a proposal under a project advertised by the U.S. Army Corps of Engineers, **Fort Worth District**. In accordance with Federal Acquisition Regulations (FAR), an evaluation of your firm's past performance will be completed by the Corps of Engineers. Your candid response to the attached questionnaire will assist the evaluation team in this process.

We understand that you have a busy schedule and your participation in this evaluation is greatly appreciated. Please complete the enclosed questionnaire as thoroughly as possible. Space is provided for comments. Understand that while the responses to this questionnaire may be released to the offeror, FAR 15.306 (e)(4) prohibits the release of the names of the persons providing the responses. Complete confidentiality will be maintained. Furthermore, a questionnaire has also been sent to _____ of your organization. Only one response from each office is required. If at all possible, we suggest that you individually answer this questionnaire and then coordinate your responses with that of _____, to forge a consensus on one overall response from your organization.

Please send your completed questionnaire to the following address:

U.S. Army Engineer District,
Fort Worth District
ATTN: CESWF-CT-C (Zimmer)
819 Taylor Street
Fort Worth, TX 76102-0300

The questionnaires can also be faxed to Barbara Zimmer, Contract Specialist at (817) 886-6407
If you have questions regarding the attached questionnaire, or require assistance, please contact Ms. Zimmer at (817) 886-1052.

Thank you for your assistance

PAST PERFORMANCE EVALUATION QUESTIONNAIRE

Upon completion of this form, please send directly to the U.S. Army Corps of Engineers in the enclosed addressed envelope, email] to Barbar.J.Zimmer@swf02.usace.army.mil or FAX (817)886-6407, ATTN: Barbara Zimmer. Do not return this form to our offices. Thank you.

1. Contractor/Name & Address (City and State):

2. Type of Contract: Fixed Price _____ Cost Reimbursement _____
Other (Specify) _____

3. Title of Project/Contract Number:

4. Description of Work: (Attach additional pages as necessary)

5. Complexity of Work: High _____ Mid _____ Routine _____

6. Location of Work: _____

7. Date of Award: _____

8. Status: Active _____ (provide percent complete)
 Complete _____ (provide completion date)

9. Name, address and telephone number of Contracting Officer's Technical Representative:

QUALITY OF PRODUCT/SERVICE:

10. Evaluate the contractor's performance in complying with contract requirements, quality achieved and overall technical expertise demonstrated.

Excellent Quality	
Above Average Quality	
Average Quality	
Below Average Quality	
Unsuccessful or Experienced Significant Quality Problems	

Remarks: _____

11. To what extent were the contractor's reports and documentation accurate, complete and submitted in a timely manner?

Excellent Quality	
Above Average Quality	
Average Quality	
Below Average Quality	
Unsuccessful or Experienced Significant Quality Problems	

Remarks: _____

12. To what extent was the contractor able to solve contract performance problems without extensive guidance from government/owner counterparts?

Excellent	
Above Average	
Average	
Below Average	
Unsuccessful	

Remarks: _____

13. How well did the contractor manage and coordinate subcontractors, suppliers, and the labor force?

Excellent	
Above Average	
Average	
Below Average	
Unsuccessful	

Remarks:

CUSTOMER SATISFACTION:

14. To what extent were the end users satisfied with:

	Quality?	Cost?	Schedule?
Exceptionally Satisfied			
Highly Satisfied			
Satisfied			
Somewhat Dissatisfied			
Highly Dissatisfied			

Remarks:

15. If given the opportunity, would you work with this contractor again?

Yes _____ No _____ Not Sure _____

TIMELINESS OF PERFORMANCE:

16. To what extent did the contractor meet the task order schedules?

Completed Substantially Ahead of Schedule	
Completed on Schedule with no Time Delays	
Completed on Schedule with Minor Delays Under Extenuating Circumstances	
Experienced Significant Delays without Justification	

Remarks: _____

OTHER REMARKS:

23. Use the space below to provide other information related to the contractor's performance. This may include the contractor's selection and management of subcontractors, flexibility in dealing with contract challenges, their overall concern for the Government's interest (if applicable), project awards received, etc.

4. TECHNICAL PROPOSAL (Volume II) SUBMISSION INSTRUCTIONS

a. General Requirements.

(1) Title Page, including the title of the solicitation, solicitation number, [offeror number (Where used) or name], and date of the submittal.

(2) The proposals shall contain a detailed table of contents. If more than one binder is used, the complete table of contents shall be included in each. Any materials submitted but not required by this solicitation, (such as company brochures), shall be relegated to appendices.

(3) Compliance Statement: The offeror is required to certify that all items submitted in the technical proposal comply with the RFP requirements and any differences, deviations or exceptions must be stated and explained. Offerors are required to complete the statement and submit it with their technical proposal. Even if there are no differences, deviations or exceptions, the offeror must submit the Compliance Statement and state that none exist.

Statement of Compliance:

This proposer hereby certifies that all items submitted in this proposal and final design documents (after contract award) comply with the solicitation requirements. The criteria specified in Solicitation No. DACA63-02-R-0013 are binding contract criteria and in case of any conflict after award, between DACA63-02-R-0013 and the contractor's proposal, the solicitation criteria shall govern unless there is a written and signed agreement between the contractor and the Government waiving a specific requirement. Should this proposal result in the award of a contract, this statement will be included on each sheet of drawings and on the cover of the specifications.

b. Exceptions to the contractual terms and conditions of the solicitation (e.g., standard company terms and conditions) must not be included in the proposal.

c. The technical proposal shall not include any cost information. The technical and cost proposals shall be submitted as separate documents.

d. Technical Proposal Requirements and Submission Format. The proposals sought by this solicitation shall contain the categories of submittal information as follows:

Design-Technical. This information shall be submitted in separate three-ring binders labeled "Design-Technical Information." Each must contain a detailed Table of Content, and each section tabbed. This category consists of design documents, sketches, outline specifications, design analysis, catalog cuts, and other information. Provide nine (9) copies. **All copies shall be numbered.**

e. Technical Data Requirements for Proposal Submission. The following technical data shall be submitted as part of the formal proposal. Proposals shall include graphic description of the design included in the basic proposal clearly indicated as such. All alternate designs shall be graphically described on separate drawings from the basic proposal. Offerors are advised that the required data listed below will be utilized for technical review and evaluation and used for determination of a "Quality Rating" by a Technical Evaluation Team. Materials indicated in the design/construction criteria, but not indicated in the offeror's specifications, will be assumed to be included and a part of the proposal.

(1) Design drawings

(a). Full size drawings shall be submitted in accordance with Section 1016, DESIGN DOCUMENT REQUIREMENTS. Each drawing shall be identified with the appropriate Sequence and Sheet Numbers in the lower right hand corner. The original and two copies of all drawings must be full size drawings. Original and nine (9) copies of half-size drawings must be provided. **All copies are to be numbered. (See General Proposal Submission Instructions d. (3) b. for drawing size)**

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(b). All alternate designs which may or may not be priced as additive or deductive items shall be graphically described on separate drawings from the base proposal design. All alternate designs shall meet the minimum requirements of the solicitation.

(c). Proposal revisions for drawings shall be submitted as sheet replacements with all changes identified on the drawings with clouds and in the title block, including the source of the revision, e.g. Error, Omission, or Clarification (EOC), amendment or other Contractor-initiated change. Revised drawings shall be numbered, dated and submitted in the same number of copies as the original proposal submittal.

(d) Provide an index of drawings. If required drawings are common for more than one type of building, indicate so on the drawing. Do not provide foundation plans or structural, civil, plumbing, mechanical, or electrical details. The proposal design drawings shall provide the information as indicated in the following tables:

SITE DESIGN

Drawing Type / Scale	Show This Information
Area Site Development Plan 1:1000 [1"=80'] Note ^{1,2}	Spatial and functional arrangement of all family housing requirements Adjacent land uses and historical or environmental conditions Project Boundaries Existing Contours Proposed contours at 1 m intervals [3']. Drainage and water retention ponds (if utilized) Vehicular and pedestrian circulation Housing types to include patios Children's outdoor play areas
Typical Cluster Plans 1:500 [1"=40'] Note ^{1,2}	Solar orientation of each housing unit or cluster Vehicular and pedestrian circulation Spacing between housing units Utilities and utility entrance into housing unit walls Children's play lots
Demolition Plan 1:500 [1"=40']	All site amenities, structures, or features to be removed or retained.
Site Plan 1:500 [1"=40']	Layout for all site requirements. Show "Use Zones" in children's outdoor play areas.
Typical Landscape Planting Plans 1:250 [1"=20']	Botanical/Common Names of plants used, size, and quantity of trees, shrubs, ground covers, related notes, and planting details.
Utility Plan 1:500 [1"=40'] Am 0005	All site utility requirements. Site lighting. Primary cable routing (new and existing). Pad-mounted transformers and service laterals. Cable television and telephone routing.
Off-Site Electrical Plan 1:5000 [1"=400'] Scale as required (If applicable)	Location of primary supply point of take-off. Existing electrical lines, both overhead and underground, properly identified. New construction tie-in to on-site electrical distribution system.

SITE DESIGN

Drawing Type / Scale	Show This Information
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Note¹: Drawings shall be dimensioned to show building separations, set back, etc.

Note²: Metric Scales are preferred, however, inch pound scales may continue to be used if they enhance competition.

HOUSING UNIT DESIGN

Drawing Type / Scale	Show This Information
Floor Plans 1:50 [1/4" = 1' -0"] (For each dwelling unit type)	Overall dimensions. Room description with dimensions and areas. Appliances (including occupant-owned washer and dryer). Plumbing fixtures and vanities. Kitchen layout. Door swings. Carport features. Patio. Exterior bulk storage. Furnace and hot water heater location. Calculated gross and net floor areas.
Typical Exterior Elevations 1:50 [1/4"=1' -0"]	Show all sides.
Typical Interior Elevations 1:50 [1/4"=1' -0"]	Kitchens and bathrooms.
Typical Wall Sections 1:20 [3/4"=1' -0"]	Typical wall, foundation, floor, and roof section. Materials. Cavity wall. Party wall. Wall fire and STC ratings
Details Scale as required.	Special Features
Finish Schedule	All rooms.

Note: Metric Scales are preferred, however, inch pound scales may continue to be used if they enhance competition.

UNIT ENGINEERING

Drawing Type / Scale	Show This Information
Mechanical Floor Plan 1:50 [1/4"=1'-0"] Note: This information may be shown on the unit electrical plans if it can be shown clearly.	HVAC system layout. Flues. Plumbing vents. Hot water heater. Equipment Efficiencies Active Ventilation Engineered IAQ System Other Energy Conservation Features Included in the Proposal
Electrical Floor Plan 1:50 [1/4"=1'-0"]	Lighting fixture locations, properly labeled to show type of fixture. Fixture schedule, which indicates general fixture description, number and type of lamps, type of mounting, and any special features. Switch locations. Convenience outlet locations. Smoke detector locations. Telephone outlet locations. Cable TV outlet locations, Carbon Monoxide Detector locations. Location of motors or special mechanical equipment. Location of unit load center panel boards. Location of multi-unit service equipment and building service. Multi-unit electrical riser diagram. Electrical legend and notes. Room names.

Note: Metric Scales are preferred, however, inch pound scales may continue to be used if they enhance competition.

(2) Specifications. Provide outline specifications, indicating the quality of materials, construction, finishes, fixtures, and equipment for the applicable items. Special attention should be given to the identification and specification of energy conservation features included in the proposal, particularly those that exceed the minimum requirements of the Statement of Work. Submit as part of the Design-Technical Information.

(3) Equipment Schedule. Equipment schedule shall indicate proposed type of equipment, size or capacities, manufacturer, and model number. Furnish manufacturer's catalog data on equipment and fixtures for all features of the facilities, this shall include appliances, electrical equipment and lighting, mechanical heating and cooling equipment, domestic water system equipment, as well as catalog information on the finishes and architectural specialties and exterior finish materials. Originals of manufacturer's catalog should be submitted in lieu of reproduces to ensure legible data. Submit as part of the Design-Technical Information.

(4) Life Safety Analysis. The proposal shall include a Life Safety Analysis that clearly demonstrates that the proposal meets or exceeds all requirements of the Statement of Work and reference standards with respect to Life Safety and Fire Protection.

(5) Evaluation Factors/Proposal Contents Listing. A spreadsheet or table consisting of all the evaluation categories and sub-categories listed in Section 0120 for technical proposal evaluation and specific reference to where in the proposal documents those requirements are addressed or indicated. Submit as part of the Design-Technical Information.

5. Pro Forma Requirements (Original and two (2) copies) (Volume III)

Pro Forma requirements. This information should be submitted in an envelope labeled "Pro Forma Requirements." This category consists of completed Standard Form 1442 (to include acknowledgement of amendments, Price Proposal Schedule (Section 00010), Representations and Certifications, Subcontracting Plan, Small Disadvantage Business Utilization Plan, and Proposal Bond. Provide original and two (2) copies.

A. Pro Forma Documents

1. Solicitations, Offer and Award. The Standard Form 1442 shall be completely filled out and signed by a principal of the firm authorized to bind the design-build team. Signature(s) must be in long hand. Include acknowledgment of all amendments to the solicitation in accordance with the instructions on the Standard Form 30 amendment form.

2. Price Proposal Schedule Prices shall be firm. The offeror's price, to be considered in the competitive negotiation evaluation, shall be the offeror's Total Base Bid, plus all options, as shown on the price proposal schedule. The cost/price proposal will be evaluated separately, after evaluation of design proposal. The cost/price proposal shall consist of the following:

- a. Offerors shall complete the Price Proposal Schedule by filling out the pricing data blanks.
- b. Overhead and profit shall be applied proportionally to each category and will not be required to be shown separately.
- c. Offerors shall include allowance for weather days in the Cost/Price Proposal and shall schedule any contingency for severe weather in accordance with weather requirements included in Section 01000, DESIGN AND CONSTRUCTION SCHEDULE.
- d. Should the price proposal include any standard company terms and conditions that conflict with the terms and conditions of the solicitation, the proposal may be determined "unacceptable" and thus ineligible for award. Should the offeror have any questions related to specific terms and conditions, these shall be resolved prior to submission of the offer. See Section 00100, PROJECT INFORMATION," FOR POINT OF CONTACT.
- e. Proposers are cautioned to check their price proposal carefully for errors prior to submission. If the Price Proposal Schedule contains unit prices, they shall be extended to the actual amount and not rounded off.
- f. Your proposal must address all items on the Price Proposal Schedule, otherwise, your offer may be determined to be unacceptable and therefore ineligible for award.

3. Price Break-down of PRICE PROPOSAL SCHEDULE. This information is required for the initial and, if requested, for any revised proposals.

4. Proposal Guarantee. The proposal guarantee shall be submitted in accordance with Section 00700, Contract Clauses.

5. Representations and Certifications. Representations are local, state, and federal representative statements and certifications made by the Offeror concerning a variety of issues. Complete each item in Section 00600, REPRESENTATIONS AND CERTIFICATIONS, and submit one original 00100, paragraph SMALL BUSINESS SUBCONTRACTING PLAN for additional information and Fort Worth District subcontracting floors.

6. **Subcontracting Plan.** (**Applies to Large Businesses only.**) All large businesses shall submit a subcontracting plan with their technical and price/cost proposals. The plan shall be prepared in accordance with FAR 52.219-9. Failure to submit an acceptable subcontracting plan may make the offeror ineligible for award of the contract. The submission of the subcontracting plan is in no way advantageous to large businesses over any small business in the evaluation process. A sample subcontracting plan and scoring checklist are included by amendment (See Amend 0002). See Section 00100, paragraph SMALL BUSINESS SUBCONTRACTING PLAN for additional information and Fort Worth District subcontracting floors.

7. **Small Disadvantaged Business (SDB) Utilization Plan.** (**Applies to all Offerors.**) Offerors shall submit a SDB Utilization Plan, to include the following information:

- a. Identification of each SDB concern proposed and the work each is to perform. (See NOTE below regarding SDB certification.)
- b. Targets expressed in dollars and percentages representing each SDB concern's participation of the total contract value. The minimum percentage for the Fort Worth District Corps of Engineers is 9.1%.
- c. Total target value of all SDB participation, expressed in dollars and percentages of the total contract value.

The offeror is put on notice that any targets represented in submitted proposal will be incorporated into and become part of any resulting contract. Changes after contract award must be fully supported and approved by the contracting officer.

NOTE 1: All proposed SDB concerns must be certified by the Small Business Administration and listed in the online database PRO-Net. SDB concerns may register in PRO-Net at <http://pronet.sba.gov>.

Am 0005 Note 2: This item will be evaluated under "Project Management Plans and Schedules

(8) Self-Performed Work

(a). **Self-Performed Work:** Identify what construction parts of the project will be "self-performed" by in-house forces and the related cost for each part, as defined below. The prime contractor must perform 15 percent of the contract work with its own organization in accordance with Section 00700, "PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)."

(b) Computation Sheet. Provide and illustrate the calculation for "percent of self-performed work", in accordance with the definitions below. Use the form attached hereinafter.

(c) The following are definitions concerning self-performance of work by the Prime Contractor, in accordance with Section 00700, "PERFORMANCE OF WORK BY THE CONTRACTOR."

(d) Self-performance of work" generally includes mobilization and utilization of owned or rented plant and equipment to be operated by the prime contractor's own employees; only those materials which will be both purchased and installed by the prime's own forces; labor associated with those aforementioned materials or equipment; only those supplies to directly support work performed by the contractor's own employees; and the contractor's own job overhead costs.

(e) The following is NOT self-performed work for purposes of the clause: Prime contractor markups for profit, general and administrative overhead, bonds, or other indirect costs on self-performed or subcontracted work; "Owner-operated equipment", rental of plant or equipment for operation by subcontractors; purchase of materials for installation by subcontractors.

(f) On the site" includes the construction site(s) as well as off-site fabrication plant or other facilities necessary to manufacture assemblies or provide materials to be incorporated into the construction project.

(g) Total amount of work to be performed under the contract is comprised of all direct (variable, fixed, one-time and semi-variable) costs to the contractor, including jobsite overhead costs, to construct the project. It generally includes all self-performed work, as defined above, and cost of all supplies, materials and subcontracts. It does not include design costs, home or branch office overhead costs or prime contractor markups for bond, profit, etc. (See the following calculation format)

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(End of Section 00110)

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Format for calculation of self –performed work is on the following page.

FORMAT FOR CALCULATION OF SELF-PERFORMED WORK

Use a format similar to the following to identify and calculate cost of the work to be self-performed. Refer to the definitions pertaining to "Self-performance of work", "On the site" and "Total amount of work to be performed under the contract". Include this information in the envelope for Pro Forma Requirements.

A. Clearly describe the work to be self-performed:

B. Show Calculation of Self-Performed Work:

B.1 Total Bid Price: \$ _____

B.2 Subtract Design Cost: (\$ _____)

B.3 Subtract G&A, home office overhead, prime contractor's markups for profit, bond, state use tax, etc. (\$ _____)

B.4 Remainder is "Total amount of work to be performed under the Contract" = \$ _____

B.5 "Work to be self-performed": = \$ _____

(Includes mobilization and utilization of owned or rented plant and equipment to be operated by the prime contractor's own employees; only those materials that will be both purchased and installed by the prime's own forces; labor associated with those aforementioned materials or equipment; only those supplies to directly support work performed by the contractor's own employees; and the contractor's own job overhead costs.)

B.6 % Self-performed Work = Line B.5/ Line B.4 X 100% = _____ %

6. RESTRICTIONS

a. Incomplete proposals. Failure to submit all the data indicated in this section may be cause for determining a proposal incomplete and, therefore, not considered for technical evaluation, or award.

**SECTION 00120
PROPOSAL EVALUATION AND CONTRACT AWARD**

1. TECHNICAL EVALUATION.

a. OFFEROR PERFORMANCE CAPABILITY Evaluation Factors:

FACTOR 1: OFFEROR PAST PERFORMANCE: This factor is the most important factor in the evaluation of Offeror Performance Capability proposals.

FACTOR 2: OFFEROR PROJECT KEY PERSONNEL: This factor is slightly less important than Factor 1 but represents a significant level of importance in evaluating proposals.

FACTOR 3: TECHNICAL APPROACH NARRATIVE: This factor is equal in importance to Factor 2.

FACTOR 4: OFFEROR RELEVANT EXPERIENCE: This factor is less important than Factors 2 and 3

FACTOR 5: OFFEROR MANAGEMENT PLANS AND SCHEDULES : This factor is equal in weight to Factor 4.

b. TECHNICAL PROPOSAL Evaluation Factors:

FACTOR 1: HOUSING UNIT DESIGN: This factor is the most important factor in the evaluation of proposals.

FACTOR 2: HOUSING UNIT ENGINEERING: This factor is slightly less important than Factor 1.

FACTOR 3: SITE DESIGN: This factor is slightly less important than Factor 2.

FACTOR 4: SITE ENGINEERING: This factor is slightly less important than Factor 3.

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~~FACTOR 5.~~

c. Overall Proposal Evaluation Consideration

At the completion of both the Offeror Performance Capability and Technical Quality evaluations the ratings will be tabulated. The Technical Quality evaluation is slightly more important in final selection than the results of the Offeror Performance Capability evaluation. At the completion of the evaluation process each proposal will be assigned a single adjectival rating for comparison and best value analysis as applicable.

2. DESIGN-BUILD PROCUREMENT PROCESS

- a. Competitive Negotiations.** In this solicitation and proposal, the Government will procure family housing units through Competitive Negotiation procedures. When a contract is awarded it will be a "Firm-Fixed Price Contract" for both design and construction.
- b. Differences in the Process.** The Competitive Negotiation procurement process differs from conventional design, bid, and build procedures in three distinct respects:

- (1) The design and construction phases are both the responsibility of the selected design-build Contractor.
- (2) The selection of the design-build Contractor is based upon the technical and quality merits of his or her proposal. **SELECTION IS NOT BASED SOLELY ON PRICE.**
- (3) Negotiations, if required, will be conducted with all offerors in the competitive range. Negotiations will be conducted privately and will not involve or allude to the proposals submitted by other offerors.

c. **Procedures.** The procedures for this Competitive Negotiation are as follows:

- (1) The Government solicits design and technical proposals to include performance capability information for the subject project through a Request for Proposal (RFP). The document you are reading is the RFP.
- (2) Offerors submit design, technical capability, and price proposals to the Government in accordance with the requirements of the RFP.
- (3) The Government evaluates each proposal individually and independently, first for conformance to the minimum requirements expressed in the RFP. Those proposals that do not meet the minimum level required by the RFP may be disqualified at this point. The remaining proposals are then further evaluated for technical quality and other salient features that meet or exceed the minimum RFP requirements. The Government evaluates each proposal according to both quality and price. **EVALUATION CRITERIA FOR TECHNICAL PROPOSALS** are covered at the end of this section.
- (4) Should it become necessary, the Government may conduct negotiations (discussions) with offerors whose proposals fall within a competitive range.
- (5) The Government awards a contract to the responsible offeror whose proposal is most advantageous to the Government, price or cost, technical and other factors considered, as described in Section 00120, paragraph 3, **BASIS OF AWARD**.

d. **Evaluation Process.** The proposal and evaluation process for this project will take place in two parts. Part I of the process will be the evaluation of all technical proposals. Part II will be the evaluation of price proposals. This analysis will be used to determine whether the offeror's cost or price proposal is reasonable, to aid in the determination of the offeror's understanding of the work, and the offeror's ability to perform this contract. The offerors responses to these requirements will be evaluated with respect to the evaluation criteria set forth in this Section.

- (1) Offeror's Performance Capability Information Volume I.
- (2) Technical Proposal Volume II. Offerors will review, evaluate, and propose a creative solution to the design problem presented.
- (3) Pro Forma, Volume III. Offerors will also include cost information with the proposal.

3. BASIS OF AWARD

a. The Government will award a firm fixed-price contract to that responsible Offeror whose complete proposal, which was evaluated to be at least conforming to the solicitation, determined to be fair and reasonable, and has been selected as the most advantageous to the Government, quality (comprised of technical approach and performance capability factors), price, and other factors considered. The rated evaluation criteria and price are considered approximately equal. As evaluation ratings and relative advantages and disadvantages become less distinct, differences in price between proposals are of increased importance in determining the most advantageous proposal. Conversely, as differences in price become less distinct, differences in ratings and relative advantages and disadvantages between proposals are of increased importance to the determination. In the event technical and price become more equivalent for two or more large businesses, the subcontracting plan will become more significant and may become the determining factor for award.

b. The Government reserves the right to accept other than the lowest priced offer. The right is also reserved to reject any and all offers. The basis of award will be a conforming offer, the price or cost of which may or may not be the lowest. If other than the lowest priced offer is accepted, that offer must be sufficiently more advantageous than the lowest priced offer in order to justify the payment of additional amounts.

c. Offerors are reminded to include their best technical and price terms in their initial offer and not to automatically assume that they will have an opportunity to participate in discussions or be asked to submit a revised offer. The Government may make award of a conforming proposal without discussions, if deemed to be within the best interests of the Government.

4. OFFEROR PERFORMANCE CAPABILITY EVALUATION PROCEDURES AND CRITERIA (Volume I):

a. All proposal information received shall be reviewed, evaluated, and rated with respect to the following rating scheme:

<u>RATING</u>	<u>EXPLANATION</u>
Unknown Performance Risk	Past performance information provided does not provide sufficient depth and breadth of experience to allow a definitive rating.
Outstanding/Very Low Performance Risk	Based on the offeror's performance record, no doubt exists that the offeror will successfully perform the required effort.
Above Average/Low Performance Risk	Based on the offeror's performance record, little doubt exists that the offeror will successfully perform the required effort.
Satisfactory/Moderate Performance Risk	Based on the offeror's performance record, some doubt exists that the offeror will successfully perform the required effort. Normal contractor emphasis should preclude any problems.

Marginal/High Performance Risk

Based on the offeror's performance record, substantial doubt exists that the offeror will successfully perform the required effort.

Unsatisfactory/Very High Performance Risk

Based on the offeror's performance record, extreme doubt exists that the offeror will successfully perform the required effort.

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b. **Offeror Past Performance:** The Government will evaluate the satisfaction of the customers in the example projects identified by the Offeror and from which Past Performance Evaluation Questionnaires have been received. The Government may contact the points of contact indicated to assure validity of the received questionnaires. The Government may contact sources other than those provided by the Offeror for information with respect to past performance. These other sources may include ACASS (Architect-Engineer Contract Administration Support System), CCASS (Construction Contractor Appraisal Support System), telephone interviews, and Government personnel personal knowledge of contractor performance capability. Offerors will be provided with an opportunity to address any negative past performance information on which the offeror has not previously had such an opportunity. **In the case of an offeror without a record of relevant past performance or for whom information on past performance is not available, the offeror may not be evaluated favorably or unfavorably on past performance.**

The following areas of major consideration will be determined from evaluation of all sources of past performance information and an overall rating provided:

(1) Quality of the Product Produced. Based on the information provided in the questionnaire and other information the Government will assess the quality of the actual constructions produced and the standards of workmanship exhibited by the Offeror's team.

(2) Adherence to Project Schedule. The Government will evaluate all information available with respect to the Offerors completing past projects within the scheduled completion times.

(3) Management Processes. The Government will evaluate all information available with respect to the Offerors on-site management of construction activities, subcontractors, and any other project management consideration.

c. **Offeror Project Key Personnel.** The Government will evaluate and rate the Key Personnel identified in the proposal package. The resumes and levels of responsibility of the principal managers and technical personnel who will be directly responsible for the day-to-day design and construction activities will be evaluated. Information should include, as a minimum, the project manager; the project architect; landscape architect; the engineers responsible for civil, electrical, mechanical and structural design; the quality control manager; and the construction manager. Data should indicate whether each individual has had a significant part in any of the project examples cited. If reassignment of personnel is considered possible, the names and resumes of the alternative professionals for each assignment will be evaluated. Additional consideration will be given to individuals who have past experience with Corps of Engineers construction project operations and who have completed the Corps sponsored Quality Control Class.

d. **Technical Approach Narrative .** The Government will evaluate the overall understanding of the design-build process as well as the Offeror's implementation plans to utilize "fast track" procedures on this project. Particular attention will be paid to the inclusion of the major construction subcontractors during the design process as well as the definition of the roles and responsibilities of the various subcontractors. Offerors are cautioned that this narrative shall not exceed five (5) pages and that the Government review staff will review and evaluate only the information contained on the first five pages in this section. Information beyond the five (5) page limit will be ignored.

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e. **Offeror Relevant Experience.** The Government will evaluate the example projects provided by the Offeror to evaluate and rate the recent experience of the Offeror in similar construction and/or design-build

projects. The examples projects that most closely resemble the project identified in this solicitation will receive the highest consideration. ~~If the Offeror cannot provide suitable relevant experience and the Government staff considers the provided information to basically indicate that the Offeror has no relevant experience, this Offeror shall be rated as satisfactory. Lack of relevant experience will not be rated favorably or unfavorably.~~

f. **Offeror Management Plans and Schedules.** This factor evaluates the Offeror's Project Management Plans as well as the proposed schedule for completion of the entire design-build project. Through this factor the Government will evaluate the Offeror's understanding of the solicitation provisions with respect to an integrated design-build process and the associated quality control, scheduling, coordination, and contract close out provisions. Each of the subfactors below is approximately equal in importance in the evaluation.

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(1). **Quality Control Plan Narrative.** The quality control narrative provided by the Offeror will be reviewed and evaluated for inclusion of specific quality control practices and requirements necessary for the successful completion of all phases of this project. These phases include design stages as well as construction specialties. Offeror's narrative must address the implications and operations of the Quality Control Plan and it's integration with the Quality Assurance Operations performed by the Government. The personnel and qualifications of the individuals performing in the Quality Control organization will be evaluated.

(2). **Schedule Information.** The schedule will be evaluated to assess the inclusion of "fast tracking" and the rational of how the Offeror intends to comply with the submitted schedule. The schedule must reflect a single task oriented structure for both design and construction. The schedule will be reviewed for completeness and the inclusion of required milestones. A schedule that improves on the Government supplied maximum duration will be considered more favorably during the evaluation.

(3). **Closeout Plan.** The Offeror's closeout plan will be reviewed and evaluated to determine the Offeror's understanding the close out requirements of the solicitation. Particular emphasis will be placed on O&M Manual production and Installation Staff training methods and processes

(4). **SDB Utilization Plan: Am 0003 ****NOTE: This item shall be submitted in Volume III (Pro Forma)******

Offeror shall furnish a SDB Utilization Plan that affords subcontracting opportunities to Small Disadvantaged Business concerns. The minimum monetary target for this subfactor is 9.1%.

ALL Offerors shall submit a SDB Utilization Plan, to include the following information:

- (a) Identification of each SDB concern proposed and the work each is to perform(See NOTE below regarding SDB certification)
- (b) Targets expressed in dollars and percentages representing each SDB concern's participation of the total contract value.
- (c) Total target value of all SDB participation, expressed in dollars and percentages, of the total contract value.

The offeror is put on notice that any targets represented in a submitted proposal will be incorporated into and become part of any resulting contract.

NOTE: All proposed SDB concerns must be SBA-certified in PRO-Net. SBA concerns can register in PRO-Net on the Internet at the following address: <http://pronet.sba.gov>.

g. **Evaluation Methodology.** The Government evaluation team will consider all information provided in the proposal individually. Once these individual analyses are completed, the team will meet and determine a rating for each of the evaluation factors for Offeror Performance Capability by consensus decision. After each of the Factors for each of the proposals are rated, the team will develop, again by consensus, a final overall rating for Offeror Performance Capability.

5. TECHNICAL PROPOSAL EVALUATION PROCEDURES AND CRITERIA (VOLUME II):

a. General. Proposals will be evaluated by a team of Government staff to determine compliance with this solicitation (as a minimum), and to evaluate the quality of the proposed materials, methods, and procedures. Each of the evaluation Factors will be evaluated by the Government and a final overall rating for the proposals shall be determined by consensus of the Government evaluation team. The rating scheme for technical proposal of the process is as shown below:

EXCELLENT: The offeror greatly exceeds the scope of the solicitation requirements in all aspects of the particular factor or sub-factor. The offeror also provides significant advantage(s) and exceeds the solicitation requirements in performance or capability in an advantageous way and has no apparent or significant weaknesses or omissions.

ABOVE AVERAGE: The offeror exceeds the scope of the solicitation in most aspects of the particular factor or sub-factor. The offeror provides an advantage in key areas or exceeds performance or capability requirements, but has some areas of improvement remaining.

HIGH AVERAGE: The offeror matches the scope of the solicitation in all aspects of the particular factor or sub-factor. The offeror does include an advantage in some but not all areas of performance or capability for this factor or sub-factor. There is room for improvement in this element.

AVERAGE: The offeror matches the scope of the solicitation in most aspects of the particular factor or sub-factor. The offeror meets the performance or capability requirements of the element but not in a way advantageous to the Government. There is room for improvement in this element.

LOW AVERAGE: The offeror meets some but not the entire minimum scope of this factor or sub-factor. The offeror does not include any advantages in any areas and does meet the minimum performance or capability requirement for the particular factor or sub-factor. The offer has many apparent weaknesses and improvements are necessary.

POOR: The offeror does not meet the minimum scope of the solicitation for the particular factor or sub-factor. The offeror does not include any advantages and does not meet the minimal performance or capability requirements for this element. The offeror contains many apparent weakness and requires improvement.

UNACCEPTABLE: The offeror fails to meet the scope of the solicitation in all aspects of the factor or sub-factor or has not submitted any information to address this evaluated item. The offeror does not include any advantages in any areas of the element and does not meet the minimum performance or capability requirements of this factor or sub-factor. The proposal includes large apparent weaknesses and the proposal will require extensive modifications to come into compliance with the minimum requirements of the solicitation.

b. Relative Importance of Factors. Refer to paragraph 1 in this section for delineation of factor relative importance.

FACTOR 1: HOUSING UNIT DESIGN. Housing unit design includes the function and appearance of housing unit materials, exclusive of the purely technical performance of internal engineering systems. The subfactors and elements considered herein deal with the planning and design of the housing units, as well as the durability and thermal performance of the materials. Consideration will be given to: the interaction of the individual housing unit to people; the degree to which the unit blends with those outdoor features of living normally associated with the family; the overall esthetics of the housing unit; and the amenities associated with livability. These latter elements include such items as separation of activities, convenience, logistics, leisure, bathing, food handling, and sleeping. The sub-factors described below will be evaluated in the following order of importance:

Ranking of Sub-Factors

Subfactor b. FUNCTIONAL ARRANGEMENT	is the most important subfactor
Subfactor a. HOUSING UNIT TYPE	is slightly less important than subfactor b
Subfactors c. and i.	
c. EXTERIOR APPEARANCE	
i. KITCHEN & FOOD HANDLING	are slightly less important than subfactor a
Subfactors d., e. and f.	
d. LIVING, DINING, & FAMILY AREAS	
e. NET FLOOR AREA	
f. STORAGE	are slightly less important than subfactors c. and i.
Subfactors g., j., k., l., and m.	
g. VEHICLE STORAGE	
j. EXTERIOR FINISHES	
k. THERMAL ENVELOPE,	
l. INTERIOR FINISHES,	
m. BATHROOM AREAS	are slightly less important than subfactors d., e., and f.
Subfactors h., n., o., p., and q.	
h. SLEEPING	
n. UTILITY & WORK AREAS	
o. COLOR SCHEMES	
p. PATIOS, Am 0003 SERVICE YARDS, &	
FENCING	
q. AMENITIES	are slightly less important than subfactors g., j., k., l., and m.

a. HOUSING UNIT TYPE

The mix of housing unit types will be evaluated on the basis shown below, where mixtures of unit types are provided, the evaluation team shall arrive at a consensus adjectival rating selection.

Single Detached Units = Rated = Excellent
 Duplex Units = Rated = Above Average

b. FUNCTIONAL ARRANGEMENT The following items will be considered in the evaluation of the unit functional arrangement:

- (1) Does the floor plan of the housing unit provide convenient circulation between living, food handling, sleeping, and bathing areas?
- (2) Does the relationship among the areas enhance flexibility of usage? Consider amenities that enhance the overall interior functions, for example, living, sleeping, food handling, and bathing.
- (3) Is an entrance foyer with a closet and visual separation from living areas provided?
- (4) Is access provided to functional areas without passing through living spaces? Where circulation is adjacent to living spaces without separation, is a minimum circulation path of 900 mm [3 ft] provided exclusive of the minimum room dimensions?
- (5) Is there a balanced relationship in the sizing of these functional areas? Consider the impact of family size on the size and relationship of areas.
- (6) Are the logistics of home operation considered, for example, furnish ability, furniture movement, circulation of expendable supplies and disposal?
- (7) Does the plan enhance indoor and outdoor living in relation to patios, screened porches, vistas, yard areas, and climate.
- (8) What other design considerations are provided which enhance the overall livability and amenity of the unit?

c. EXTERIOR APPEARANCE The following items will be considered:

- (1) Variety in facades, roof lines, and entrances.
- (2) Interesting staggering of housing units.
- (3) Proportions of fenestration in relation to elevations.
- (4) Visual effects of ~~am 0003 garages~~ **CARPORTS** on the housing units.
- (5) Shadow effects, materials, and textures.
- (6) Proportion and scale within the structure.
- (7) Other aesthetic considerations.

d. LIVING, DINING, AND FAMILY AREAS (Furnish ability and circulation are evaluated under sub-factor **Am 0003** & **"b"** above.) The following interior design elements which enhance the individual and family group aspects of recreation, leisure, and entertainment such as the following, will be considered:

- (1) Possibilities for joint use or concurrent separate activities.
- (2) Location of convenience elements, for example, light switching, convenience outlets, and TV outlets.
- (3) Amenities, such as ~~Am 0003 fireplaces~~ and built-in bookcases.
- (4) Living Room
- (5) Dining Area
- (6) Family Room and Secondary Dining Area

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e. NET FLOOR AREA

Net floor area will be evaluated in the following manner: Proposals that meet the basic net area required are assigned a minimum ~~number of points~~ **rating**. Additional consideration will be given for proposals that include areas in excess of the basic net area. Proposals that include units, which do not achieve the stated minimum areas, will be considered non-conforming.

f. STORAGE Consideration will be given to the size, location, and utility of all storage areas including shape of space, finish, lighting, and shelving provided.

- (1) Exterior bulk storage.
- (2) Interior bulk storage.
- (3) Closet (linen, coat, clothing).

g. VEHICLE STORAGE Consideration will be given to type of garage proposed, proximity of second parking spaces, and/or covered walkways to the housing units, as well as appropriate treatments with respect to prevailing climatic conditions. This item does not include consideration of space in excess of that required for automobile storage only. Additional **Am 0003 storage** space included or integral to **Am 0003 garages, carports** will be evaluated as storage under the STORAGE sub-element. Aesthetics are considered under EXTERIOR APPEARANCE.

h. SLEEPING Consideration will be given to the size and proportions of bedrooms as related to windows, doors, furniture arrangement, and closet access in the area. Access to bedrooms, as well as the relationship to other functional areas, are **Am 0003 treated considered** under FUNCTIONAL ARRANGEMENT. Closet size is **Am 0003 addressed under STORAGE is considered under storage**. The following design issues will be evaluated:

- (1) Bedroom size. Additional consideration for area and/or dimensions in excess of specified minimums.
- (2) Furnish ability.
- (3) Visual and acoustic privacy.

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i. KITCHEN AND FOOD HANDLING The kitchen is the focal point of activity for the homemaker. Considerable initiative and innovative approaches to the design of the area can be achieved by the offeror to enhance this major logistics and control area. Its relationship to living, dining ingress and egress, and sleeping has been addressed in FUNCTIONAL ARRANGEMENT. Consider the following design issues:

- (1) Efficiency of food preparation triangle including the circulation of persons and materials.
- (2) Pedestrian and product circulation (controlled basically by relationship of counter space to major appliances).
- (3) Size and layout of cabinetry and counter areas. ~~(Add points for area above the minimum requirements.)~~ **(Additional consideration may be given for area above the minimum requirements)**
- (4) Outlet number and placement.
- (5) **Am 0003** ~~Provision of a space with electrical outlet for an occupant-owned freezer.~~
- (6) Visual privacy.

j. EXTERIOR FINISHES This sub-element evaluates the aesthetics, maintainability, and quality of windows, doors, **Am 0003 siding**, roofing, soffits, fascia and trim, and exterior painting and stains here. **Proposers are encouraged to review the materials and constructions submitted carefully with respect to Sustainable Design Considerations as listed in the Statement of Work.** Particular attention should be paid to finishes, which require the minimum amounts of cyclical maintenance.

k. THERMAL ENVELOPE This sub-element evaluates the thermal performance of the following house elements: walls, roof and ceiling, floors and perimeters, windows and glazing, doors, and tightness (reduction of infiltration). The integrity of the thermal envelope is a prime consideration in complying with "Energy Star" program requirements. Proposals that do not comply with the stated minimums will be considered as non-conforming and may be eliminated from further consideration.

l. INTERIOR FINISHES The quality, durability, maintainability, and aesthetics for each of the following will be evaluated:

- (1) Walls and ceilings.
- (2) Flooring.
- (3) Shelving, wainscots and moldings.
- (4) Kitchen and Bath cabinets and tops. Also consider quantity.
 - (a) Factory pre-finished laminated (natural wood) is preferred for cabinets.

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- (b) ~~Laminated plastic with integrally molded backsplash and nosing is preferred for countertops.~~

m. BATHROOM AREAS The technical portion of the RFP sets forth the minimum size of full baths, as well as the required and/or desirable fixtures, furnishings, and finishes of the bathrooms. Beyond these design requirements, amenities gained through additional net area, furnishings, layout, and privacy will be considered, including:

- (1) Number and size.
- (2) Furnishings (e.g., vanities with or without cabinets, other storage, and heat lamps).
- (3) Layout (convenience and attractiveness).
- (4) Visual and acoustic privacy.

n. UTILITY AND WORK AREAS This sub-element provides for occupant-owned or Government-furnished washers and dryers in an area of the housing unit which provides for efficient product circulation and yet does not infringe on other functions. The occupant owned freezer may also be housed in this area. This sub-element evaluates utility and work space above the minimum requirement, an enclosed washer/dryer space. The overall goal is to provide a space for the washer/dryer, freezer, ironing, and hobbies. Overall functional layout, as it relates to other areas, should be considered under FUNCTIONAL ARRANGEMENT. The following concerns will be evaluated:

- (1) Does the area provide efficient work space and work flow without infringing on other functions?
- (2) Is the area suitable for ironing and/or light hobby work?
- (3) Is the location and layout well designed to accommodate mechanical equipment?
- (4) Size and layout.
- (5) Provision of shelving, storage, lighting, and convenience outlets.
- (6) Location of mechanical equipment with respect to access, convenience, and noise.

o. COLOR SCHEMES This sub-element considers the aesthetics and coordination of interior and exterior finish designs.

p. PATIOS, Am 0003 ~~SERVICE YARDS, AND FENCING~~ Size, quality of materials, arrangement, and visual appearance of ~~Am 0003 these~~ this supporting ~~amenities~~ amenity will be evaluated here.

q. AMENITIES This area evaluates desirable features or amenities not required in the SOW (e.g., patio roofs, screened porches, built-in features, bus shelters, or other amenities).

FACTOR 2: HOUSING UNIT ENGINEERING. In addition to system design, each subfactor evaluates the choice of materials for the systems in terms of life cycle cost effectiveness. Since these new housing units will be “Energy Star” Homes, proposals must include information required to allow the evaluators to determine compliance with the minimum requirements of the solicitation with respect to Energy Conservation. Proposers are encouraged to adopt and/or develop additional means and methods to enhance the performance of the submitted units. Considerations such as durability, corrosion resistance, pest and termite resistance, ease of maintenance, life cycle cost of maintenance, and energy efficiency should be included within the following sub-factors:

Ranking of Sub-Factors

Subfactor a This is the most important subfactor
Subfactor b This subfactor is less important than subfactor a.
Subfactor c This subfactor is slightly less important than subfactor b
Subfactor d This subfactor is less important than subfactor c
Subfactor e This subfactor is a GO NO GO subfactor.

a. ENERGY STAR PROGRAM CONSIDERATIONS. This element considers the quality of the energy conservation investments that the proposer has included in the unit design. While the solicitation sets minimum standards for compliance, this element considers the overall quality of the housing unit systems and can provide additional consideration for systems that exceed the stated minimums.

- (1) Residential Appliances. Consider energy star labeled refrigerator and dishwasher and other appliance upgrades with respect to energy conservation.
- (2) Ductwork Systems. The design and general layout of the systems are evaluated in subfactor b **Am 0003** ~~above~~ **below**. This item represents efforts and procedures outlined in the proposal with respect to duct sealing and leakage reduction.
- (3) Infiltration Reduction Systems. This item considers measures proposed which exceed the minimum requirements set forth in the solicitation.

b. HEATING, VENTILATION, AND AIR CONDITIONING This element considers the quality of heating, ventilating, air conditioning, control systems, and associated equipment design to provide personal comfort in a life cycle cost effective manner.

- (1) System design: Supply air distribution
- (2) System design: Return air
- (3) Kitchen exhaust systems
- (4) Air Handling/Furnace system. Consider equipment efficiencies, features, and maintainability.
- (5) Condensing unit/ **Am 0003** **Ground Coupled Heat Pump** . Consider equipment efficiencies, features, and maintainability.

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(6) Active Ventilation Engineered IAQ system

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c. INTERIOR ELECTRICAL SYSTEM This element considers wiring, switching, and panel design (e.g., panel size, number of circuits, provision of spares). ~~Quality points are also~~ **Additional consideration may be** given for provision of fixtures, outlets, and switching in excess of minimum requirements.

- (1) System design.
- (2) Outlet and switch placement and quality.
- (3) Fixture quality. Evaluate both aesthetics and energy conservation qualities.
- (4) Electrical equipment quality.

d. INTERIOR PLUMBING SYSTEM This element considers piping systems design quality, fixture quality, and water heater size and recovery.

- (1) Piping zoning, layout, and isolation
- (2) Piping size and material quality
- (3) Fixtures and accessories. Evaluate quality and water usage.
- (4) Water heater size and recovery. Evaluate quality of water heater with respect to energy conservation. Consideration should be given to power ventilated water heaters as well as sealed combustion water heaters.

e. STRUCTURAL SYSTEM This element considers the quality of the foundation and framing system design.

FACTOR 3: SITE DESIGN. Site design includes overall planning, layout, design and development of the housing site(s), exclusive of utility systems. It embraces consideration of community appearance, compatibility of grounds and buildings, functionality, dignity, and livability. Generally excluded are considerations relative to the quality of materials, which are evaluated elsewhere. Elements making up this factor are itemized below:

Ranking of Sub-Factors:

- Subfactor a. This is the most important subfactor
Subfactor b. This subfactor is slightly less important than subfactor a.
Subfactor c. This subfactor is less important than subfactor b.
Subfactor d. This subfactor is equal in importance to subfactor c.
Subfactor e. This subfactor is equal in importance to subfactor d.
Subfactor f. This subfactor is equal in importance to subfactor d.

a. SITE UTILIZATION AND AREA DEVELOPMENT PLAN The project density in housing units per hectare [acre] is pre-established by the project scope and the composition (number of units and number of bedrooms) in relation to total area prescribed for development. Within this pre-established parameter, elements of site design to be evaluated include:

- (1) Family Housing Area Development Concept
- (2) Clustering. Grouping of structures to provide good accessibility to and from streets, parking areas, and usable attractive open areas.
- (3) Building Solar Orientation and Variation of Structure Setback and Appearance. Achieving a desirable orientation of the majority of buildings with respect to solar gain, prevailing breezes and views, taking into account topography and climatic conditions in the area. Also consider unit setbacks, the relationship between units, and the relationship of units to the surrounding structural and existing landscape elements (e.g., trees, screens). A variation of the number and type of housing units shall be provided to produce a variety of exterior appearances.
- (4) Buffering, Open Space, and Separation Between Structures. Consider separation of buildings from heavy traffic lanes and surrounding land uses not compatible with a resident development. Consider open space other than major recreation fields and play lots provided by the proposed layout. Evaluate adequacy of spacing between units to ensure sound, light, and individual and group privacy.

b. LANDSCAPE PLANTING PLAN This sub-factor evaluates the design, quality, quantity, and location of trees, shrubs, plantings, ground covers, and grass used to screen and enhance individual living units and recreation areas. **Am 0003 Reference the Fort Sam Houston Landscaping Master Plan for plan types and verities.** Considerations include screening, decorative planting, and the following:

- (1) Screening and Shading

- (a) Have plant material been specified that is hardy to the area?
- (b) Are plantings provided which screen between adjacent housing units, structures, and clusters to enhance privacy of the occupants? Consider number, size, type, and quality of trees and shrubs proposed.
- (c) Are planting clusters provided to discreetly conceal trash container sites and clothes drying areas to the maximum extent possible without interfering with pedestrian and service vehicle access? Consider number, size, type, and quality. (Mandatory if screening fence is not provided.)
- (d) Do trees provide summer solar shading on east, west, and south exposures of children's outdoor play areas?
- (e) Are foundation plantings provided as appropriate to meet low maintenance requirements? Consider number, size, type, and quality.
- (f) Are trees and shrubs used appropriately to define the open spaces?

(2) Street Trees.

- (a) Are street trees provided in accordance with a street tree scheme for the hierarchy of streets in the area? Consider number, size, type, and quality.
- (b) Have street trees been specified that are hardy to the area?

c. VEHICULAR CIRCULATION This sub-factor evaluates the capability of primary, secondary, and feeder streets to provide access to the units, community facilities, and service access to the units. The factor also evaluates vehicular and pedestrian safety. Considerations include the following:

(1) Access.

- (a) Is there convenient and direct access to and from and between each structure and/or cluster, and to community facilities?
- (b) Is the new street system a logical extension of the adjacent community?
- (c) Does the primary, secondary, and feeder street system minimize traffic conflict points, minimize the number of turning movements at intersections, and maximize spacing of intersections?

(2) Service.

- (a) Can service vehicles (maintenance, trash, moving vans and emergency) circulate efficiently in the development?
- (b) Can delivery service trucks and moving vans gain access to and park in proximity to the housing units?
- (c) Can fire trucks and ambulances gain immediate and direct access to each housing unit?

d. CHILDREN'S OUTDOOR PLAY AREAS This sub-factor evaluates the quality and quantity of play lots and ~~Am 0003 neighborhood parks~~. Considerations include the following:

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~~(1) Neighborhood Parks~~

- ~~(a) Have age appropriate play events and equipment been provided for the 5-9 year age group?~~
- ~~(b) Have age appropriate play events and equipment been provided for the 9-15 year age group?~~

(2) Play Lots

- (a) Have age appropriate play events and equipment been provided for the **Am 0003** ~~6 week~~ **12 months** - 5 year age group?
- (b) Have age appropriate play events and equipment been provided for the 5-9 year age group?
- (c) Have the requirements for age appropriate scale been applied to the children's outdoor play areas?
- (d) Have the requirements for use zones under and around play equipment been applied to the children's outdoor play areas?
- (e) Are the use zones shown on the site plan?
- (f) Have the requirements for a playground safety surface been applied to the children's outdoor play areas?
- (g) Have poisonous plants and plants with thorns been avoided or removed from the children's outdoor play areas?

e. PEDESTRIAN CIRCULATION This sub-factor evaluates the way in which the walkway system supports the movement of pedestrians from one location to another. If the overall street pattern does not make sidewalks functionally compatible with the sub-elements of a good pedestrian circulation system listed below, then the ratings assigned must reflect this functional inadequacy. Considerations include the following:

(1) Individual Units: Building Parking and Refuse Disposal

- (a) Does the walkway system provide short direct access routes to the fronts of all housing units within a cluster and to adjacent clusters?
- (b) Are parking areas connected to the structures they serve by walkways?
- (c) Can all parts of the parking areas be reached without leaving the pavement?
- (d) Does the walkway pattern minimize pedestrian traffic within the parking areas?
- (e) Are walkways provided between housing units and trash containers and beyond that to street pickup points?

(2) To Play Lots, **Am 0003** ~~Neighborhood Park~~ **existing Patch-Chaffee community and play lots, Basketball courts**, Bus Stops, and Off Site Recreation Areas, ~~Schools~~, Community Buildings, etc.

- (a) Do walkways provide convenient routing to the above functions?
- (b) Can play lots be reached without crossing primary or secondary streets?
- (c) Does the walkway system provide a natural and convenient routing **Am 0003** ~~to a school within walking distance or to the nearest school bus stop?~~

f. PARKING This sub-factor evaluates the proximity of parking to housing units and the layout of parking spaces. Considerations include the following:

(1) Proximity to Housing Units. Preferences are defined in descending order:

- (a) Two spaces per housing unit adjacent to (within 7600 mm [25 ft]) the **Am 0003** ~~garage~~ **Carport**.
- (b) One or two spaces adjacent to (within 7600 mm [25 ft]) the **Am 0003** ~~garage~~ **carport**. Other spaces within 15200 mm [50 ft] of the housing units.
- (c) Parking areas within 15200 mm [50 ft] of the housing units.
- (d) Parking areas over 15200 mm [50 ft] from the housing units.

(2) Layout of Parking Areas. Evaluate in terms of:

- (a) Internal circulation.
- (b) Minimizing conflicts between cars entering and leaving the parking areas.
- (c) Elimination of the necessity for backing into primary streets.
- (d) Separation of parking area entrances and exits from street intersections.

FACTOR 4: SITE ENGINEERING. Site engineering includes the technical performance of site design and exterior utility systems. The quality of the proposed construction materials is also evaluated in each element. Particular emphasis is placed on durability, corrosion resistance, pest and termite resistance, ease of maintenance, and life cycle cost of maintenance requirements. Consideration will be given to the suitability of the chosen material to the environment in which it is to be placed. Evaluation includes consideration of engineering aspects of operation and maintenance. Utility systems are to be evaluated beyond the 1500-m [5-ft] line from the housing units. Elements making up this factor are itemized below:

Ranking of Sub-Factors

- Subfactor a. This is the most important subfactor.
- Subfactor b. This subfactor is less important than subfactor a.
- Subfactor c. This subfactor is equal in importance to subfactor b.
- Subfactor d. This subfactor is equal in importance to subfactor b.
- Subfactor e. This subfactor is equal in importance to subfactor b.

a. SITE INTEGRATION This sub-factor evaluates grading, drainage, its integration with natural features, and the proposals integration with the surrounding area.

(1) Integration with Surrounding Area. This element evaluates the integration of physical flows and relationships with, and between, the site and surrounding area.

(2) Preservation of Natural Features. This element evaluates the preservation of trees, natural drainage swales, streams, and any other natural and historic features that lend interest and appeal to the community.

(3) Grading. This element evaluates the effects of grading on the natural features of the site and the topographic features and character of the surrounding areas and region.

(a) Consider the aesthetic effects of grading.

(b) Does the grading plan enhance and blend with the natural conditions on the site? Does it blend the proposed development into the general topographic character of areas surrounding the site and the region in general?

(4) Drainage Design. This element evaluates the quality and effectiveness of the drainage system design in handling surface runoff. See SOW Paragraph 4. -4. for additional requirements.

b. WATER SYSTEM Evaluates system design, material quality, and maintainability.

c. FUEL PIPING AND STORAGE Evaluates piping sizes, material quality, layout, accessibility, and cutoff isolation.

d. ELECTRICAL DISTRIBUTION Evaluates system design, material quality, and maintainability.

e. SANITARY SEWER Evaluates system design, material quality, and maintainability.

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6 5. EVALUATION OF PRO FORMA REQUIREMENTS (VOLUME III):

The Contracting Officer shall consider several factors in the selection process that are important, but not quantified, such as:

a. Submission of all required forms, duly executed with an original signature by an official authorized to bind the company.

(1) Completed Standard Form 1442

(2) Price Proposal Schedule

(3) Price Breakdown of Proposed Prices

(4) Bid Bond

(5) Representations and Certifications

b. Submission of an acceptable Subcontracting Plan in accordance with the terms and conditions of the solicitation. See Section 00120, paragraph 3, BASIS OF AWARD, for subcontracting plan evaluation considerations.

(1) In accordance with FAR 52.219-9(h), "Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract."

(2) Pursuant to AFARS 19-705-4(d), the Subcontracting Plan will be reviewed and scored in accordance with AFARS Appendix CC. Include in the plan a list of Subcontracts by description of type of service or supply. Include in the plan a list of Subcontracts by description of type of service or supply. Include a list of Subcontractors by name, address, and business type, i.e., as stated at paragraph (d) (3) of clause 52.219-9.

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c. Self-Performed Work

Review of the Self-Performed Work computation sheet to determine if required minimum percentage has been met or exceeded.

- d.** Agreement by the offeror to all general and special contract provisions and clauses.
- e.** Acknowledgement of all amendments.

(End of Section 00120)

STATEMENT OF WORK**1. DESIGN OBJECTIVES.**

1-1 The design and construction shall comply with the specifications and requirements contained in this Request for Proposals (RFP). The design and technical criteria contained and cited in this RFP establish minimum standards for design and construction quality. All housing units constructed in accordance with these standards are "Energy Star Homes".

1-2 Work Scope. The objective of this solicitation is to obtain housing complete and adequate for assignment as quarters for military personnel and their families. This contract shall consist of the design and construction of a total of **70 senior and junior noncommissioned officer** housing units, **parking, roads and site amenities (AM#4)** on Government-owned land at **Fort Sam Houston, Texas**, which comply with this RFP. Work shall consist of the following:

1-2.1 Housing Units. Housing units with patio or balcony, **carport (AM#4)**, exterior storage, individual central heating systems, energy conservation systems and central air conditioning, and including the following Contractor-furnished/Contractor-installed (CF/CI) equipment and appliances: range, refrigerator, garbage disposal, dishwasher, water heater, carbon monoxide alarms, and smoke detectors. **The 20 SrNCO units are to be sited together. The 50 JrNCO units are to be sited together. SrNCO and JrNCO units are not to be mixed amongst each other. The exception to this are the accessible housing units mentioned in paragraph 1-2.2. (AM#4)** Housing units shall be a mix of three- and four- bedroom housing units as shown in Table 1-1:

TABLE 1-1 - HOUSING UNITS

Pay Grade	Number of Bedrooms	Number of Units
E-7 through E-9 (SNCO)	3	20 units
E-1 through E-6 (JNCO)	4	50 units

1-2.2 Accessible units. No less than five (5) percent of the units shall be handicapped accessible. This would result in a minimum of one (1) Sr. NCO unit and three (3) Jr. NCO units being handicapped accessible. These housing units shall be designed and built in such a way that they may be easily and readily modified to accommodate physically challenged occupants at time of occupancy. Design of accessible housing units shall conform to the Uniform Federal Accessibility Standards (UFAS) and American Disabilities Act Accessibility Guidelines (ADAAG). Accessible housing units shall be located at the northern portion of the site bound by Patch, Chaffee and W.W. White Roads (north of unit 881 and east of units 831 to 834). The requirement to have an additional two (2) percent of housing units equipped with warning devices for the hearing and visually impaired will be met at the time the unit is assigned to an occupant needing this equipment.

1-2.3 Site area and density.

1-2.3.1 Site area. The site/s is/are described on the RFP drawings included as part of this solicitation and includes approximately 17.2 hectares [42.6 acres]. Site work includes all design and construction of the site design to include grading, storm drainage, erosion control, pedestrian and vehicular circulation, utility systems, outdoor lighting, play lots and physical security.

1-2.3.2 Site density. This project consists of 70 housing units on **7.1 hectares [17.7 acres] of land area (AM#5)**. The project site is approved for **LOW DENSITY** siting. Site development shall comply with the minimum requirements for **LOW DENSITY** siting. The new housing area will be constructed on the site located

along the eastern boundary of the existing Patch-Chaffee housing area. The site is bound on the north by Hardee Road and to the south by Wilson Street. **For construction purposes, the southern boundary will be Taylor Street. Chaffee Road (AM#4)** and Forage Avenue encompass the western and eastern boundaries, respectively for the construction of new homes. An additional area at the northwest corner of the Allen Road/Patch Road intersection can be developed as green space, as needed. **The existing playground located between Patch and Chaffee Roads and Crockett and Lawton Roads will remain. (AM#4)** The southern portion of the site (between Road S-23, Wilson Street and Taylor Street) used to house an aircraft maintenance shop and other industrial facilities and has been determined to be a contaminated site. This area shall not be developed for new construction. Refer to paragraph 14- ENVIRONMENTAL for additional information.

1-2.4 Special utilities and supplementary construction. If OPTION 1- Ground Coupled Heat Pumps, is selected, site gas distribution is not required.

1-2.4.1 Waste Area. Waste material, except for **regulated** asbestos containing material, shall be disposed of by the Contractor. Disposal area shall be located off Government controlled property, at the Contractor's expense and responsibility.

1-2.4.2 Haul Routes. See the Project Location Map in the RFP drawings.

1-2.4.3 Bench Marks. See the topographic maps in the RFP drawings.

1-2.4.4 Contractor's Staging Area and Storage Yard. A Contractor's storage area and storage yard shall be located within the project boundaries, as described in paragraph 1-2.3.2 above and as directed by the Contracting Officer.

1-2.4.5 Security Fencing. A 1.83 m (6 ft) high temporary chain link construction fence **(AM#5)** shall be installed and maintained around the construction site (including the staging area and storage yard) during construction for security and the safety of children, pedestrians and others living nearby. This fencing shall remain in place for the duration of the contract. Stored materials, equipment and construction trailers shall be located within the staging area and storage yard.

1-2.5 Demolition considerations and requirements. Demolition will consist of any utilities and/or subsurface structures (i.e. foundations, piers) that have been abandoned in place and which fall within the boundaries of new construction and existing roads and curb and gutter, as needed, to construct the proposed design. **Replace Road No. S-23 between Lawton and Crockett Roads. Replace the street located one block east of Road No. S-23, between Harney and Schofield Roads. This street may be rerouted, as deemed necessary. (AM#4)** Utility systems and streets must be demolished in such a manner as to maintain active service and vehicular circulation to the existing housing area. Existing maps indicate that several buildings and a swimming pool once existed on the site between Crockett and Wilson Roads and between Road No. S-23 and Forage Road. These areas shall be thoroughly investigated to determine the extent and/or presence of subsurface structures that may have been abandoned in place and will require removal before construction. The approximate location of the swimming pool has been identified on the topographic maps included in the RFP. See paragraph 14- ENVIRONMENTAL for environmental demolition concerns that may be encountered.

1-3 Energy Star Homes Program Requirements: The Contractor, at the direction of the USACE Contracting Officer's Representative, shall be required to submit to the EPA the necessary information and certifications to register the units constructed in this project as Energy Star Homes. The contractor constructing housing units in accordance with this Statement of Work is not required to be a registered Energy Star Contractor. The required information can be submitted to EPA in several methods:

1-3.1 Through the Internet by clicking on the *certificate automation system* icon at the World Wide Website <http://yosemite.epa.gov/appd/eshomes/eshomes.nsf> and following the instructions

1-3.2 By emailing to certificates@epa.gov

1-3.3 By mailing to the EPA Customer Service Manager (address & tel. no. below):

The following information needs to be submitted for each home [note: homes can be submitted *individually* (each home individually tested/rated) or in a "*batch*" (for batches of homes, particular unit types). The following data should be provided for each home (note: this can be in the form of a spreadsheet, database, word processing file or email; if the format changes in the future EPA will inform the contractor of the changes):

Contractor company name (ex. Jones Construction Co.)

Contractor telephone number (ex. 703-123-4567)

Name of company/organization performing testing/rating (ex. Jones Construction Co.)

Telephone number of company/organization performing testing/rating (ex. 703-123-4567)

Street address of home being submitted, including city, state & zip code (ex. 123 Smith St., City, State 12345)

Type of verification:

"FEP" --- if this particular home underwent infiltration testing (and possibly duct leakage testing). Please list the tested infiltration value in ACH/nat (natural air changes per hour) and if tested, the duct leakage to nonconditioned spaces in cfm and % of air handler flow at a pressure of 25 pascals.

SEP --- if this particular home did *not* undergo infiltration and/or duct leakage testing, but was a member of a batch out of which at least 15% DID; if so, then the address of a home that was a tested member of this batch should also be identified as the tested member of the batch.

1-3.4 The following statement: "This home qualifies as an EPA Energy Star Home by conforming to the residential energy efficiency specifications and quality control confirmation of U.S. Army Corps of Engineers TI 801-02, Family Housing, 01-Oct-01 (AM#4), which has been determined by the EPA and USACE to be an **Equivalent Program** to the EPA Energy Star Homes Program." In addition, the "checklist" of home specifications that the USACE Contracting Officer's Representative uses to ascertain if the TI 801-02 specifications and testing results were met should be submitted. The statement and checklist should have the USACE Contracting Officer's Representative's signature affixed.

The year the house was built (ex. 2001)

The year the house was submitted for Energy Star certification (ex. 2001)

The name and title/rank, mailing address, email address, telephone number and fax number of the USACE Contracting Officer's Representative overseeing the contractor's adherence to construction specifications, quality control of construction and testing/rating activities.

1-3.5 The Contractor will make arrangements with the EPA for receipt of the "Energy Star Homes" certificates and unit plaques and shall provide the certificates to the USACE Contracting Officer's Representative and include in the project the installation of the plaques on each of the housing units. Coordination point with the EPA regarding Energy Star certification and plaques shall be as follows:

United States Environmental Protection Agency

Climate Protection Division

US EPA 6202J

Washington DC 20460

ENERGY STAR Homes Customer Service Manager

ATTN: Mr. Brian Ng, Ng.Brian@epa.gov, 202-564-9162, fax: 202-565-2079

<http://www.energystar.gov/homes>

Technical questions on the Energy Star Homes Program in general can be addressed to:

ENERGY STAR Homes Technical Coordinator

ATTN: Mr. Glenn T. Chinery, Chinery.Glenn@epa.gov, 202-564-9784, fax: 202-565-2079

1-4 Design Freedom. Requirements stated in this RFP are **minimums**. Innovative, creative, or cost-saving proposals which meet or exceed these requirements are encouraged. Existing housing plans or modifications thereof that meet the design and construction criteria specified herein, which an offeror has previously constructed and priced, may be submitted. They may include designs incorporating factory fabricated

components or modules. Deviations from space and adjacency requirements are discouraged unless the changes result in improvement to the facilities.

1-5 Housing Units. Site-built, factory-built units are acceptable options for this project.

1-6 Definition of Housing Unit Types. Terms for housing unit types used in these criteria are defined as follows:

1-6.1 Site-built housing. A residential building or housing unit wholly or substantially constructed at the site.

1-6.2 Factory-built housing. Construction consisting of components, sub-assemblies such as modules, panelized walls, roof trusses, floor joists, and other factory-assembled components, which are transported to the construction site and further assembled into completed housing units. All interior and exterior walls, regardless of whether they are structural (load bearing) or not, are plant fabricated (panelized). Panels must be fabricated to the extent that the structure of the panel or truss is factory-assembled. Finishes such as interior wall board may be site applied.

1-6.3 Deleted

1-6.4 Deleted

1-6.5 Deleted

1-6.6 Duplex. One or two-story housing units joined together by a common party wall and each housing unit entered directly from the exterior.

1-6.7 Deleted

1-6.8 Detached house. A single-family housing unit which is not attached to another housing unit.

1-7 Design Quality. The objectives are to obtain housing structures and complimentary site development within funds available and to optimize livability. Design quality is achieved through the optimization of interior planning, integration of housing structures to the site, and balancing architectural attractiveness, variety, function, and design for low-cost maintenance and operation. Offerors should consider sustainable design applications, as described in paragraph 13, in developing proposals.

1-8 Installation Real Property Master Plan. The installation real property master plan provides comprehensive documentation of the existing conditions of natural, man-made, and human resources. It also guides the future land-use development. The real property master plan should be consulted as it is the mechanism for ensuring that individual projects are sited to meet overall installation goals and objectives for land use development

1-9 Installation Design Guide. Design of this project shall incorporate the design guidance and criteria contained in the Installation Design Guide, excerpts of which are contained in VOLUME IV, ATTACHMENTS .

1-10 Energy and Resources Conserving Features. Public Law 102-486, Executive Order 13123, and Federal Regulations 10 CFR 435, require Federal buildings to be designed and constructed to reduce energy consumption in a life-cycle, cost-effective manner using renewable energy sources when economical. Products designed to conserve energy and resources by controlling the amounts of consumed energy or by operating at increased efficiencies should be considered. Minimum requirements for this project are High-efficiency central air conditioning and/or heating units, setback thermostats, and water flow-limiting plumbing fixtures. Offerors are required to provide Energy and Resource conserving improvements that at least insure compliance with the Energy Star Homes Program parameters.

1-11 Prototype Housing Units. The purpose of the prototype housing unit is to verify the details of the approved design and material selections, and to establish the quality level against which the remaining work

will be judged. At the plant, or at the site, construction connection details shall be exposed for study by authorized Government inspectors for a period of time agreed to by the Contractor and the Contracting Officer. The housing unit or units at the plant and/or the prototype at the site are subject to Contracting Officer's approval. At the site, the complete prototype shall be constructed for each housing unit type. Each stage of work shall be completed and accepted on the prototype prior to starting work on the same stage for similar housing units in the project.

1-11.1 "Site-Built." A prototype housing unit shall be required for each housing unit type.

1-11.1.1 Where multiple prototype units are being constructed, one or two prototype units shall be left in the "rough in" stage (no interior finishes) so that the utility systems and framing construction is exposed. Exteriors of these prototypes shall be completely finished. When the last new units are constructed, these "rough in" stage prototype units shall be completed and turned over to the Government with the last turn-over group.

1-11.2 "Factory-Built." A prototype housing unit shall be required for each housing unit type of each run fabricated at the plant for manufactured or factory-built homes.

1-11.3 Deleted

1-11.4 Factory-Built. If the housing units are classified as factory-built housing, all wall panels which are fabricated in the plant for shipment to the site shall have prototype units constructed and assembled for in-plant inspection by the Government. This shall include, as a minimum, wall framing, roof and ceiling framing, connection details, utility piping, wiring and ductwork, interior and exterior wall finishes which form part of the factory-built wall. In addition, the Contractor shall construct as part of the factory-built prototype, installed samples of wall insulation, finished siding (if not part of wall assembly), sample installed bathtub and sink and installed kitchen sink and cabinets to demonstrate proper installation and wall connections. Portions of the work shall be left unfinished or exposed to demonstrate interior construction details.

1-11.4.1 One Floor Prototype. If only one floor of the prototype is factory-built, factory assembly of the factory-built portion of the prototype is required. In all cases, the factory prototype shall consist of one of each building type. The factory prototype shall be assembled to verify assembly connections, details, construction, and transportation of the finished housing unit.

1-11.4.2 Structural Integrity. Manufactured and factory-built homes shall be of individual housing units attached to one another in a manner which shall provide a finished structural assembly having an appearance and structural integrity comparable to a site-built single or multi-family residence built to applicable codes.

1-11.4.3 Construction Tolerances. Assembled housing units shall be true and plumb and all within specified construction tolerances for all alignments represented on the drawings. Adjacent walls shall be attached at roof and floor levels in such a manner as to preclude placing any wood member in cross-grain bending or cross-grain tension, and to avoid putting nails in withdrawal.

1-12 Deleted

2. CRITERIA REFERENCES.

2-1 Criteria to be used for design and construction shall be taken from the most current references at the date of issue of the RFP. Administrative, contractual, procedural, and environmental features of the contract shall be as described in other sections of the RFP. Referenced codes and standards herein and those listed below are minimum acceptable criteria.

2-2 Local and State Codes or Standards. The following specifications, standards, bulletins, and handbooks form a part of this document to the extent specified herein. (AM#4)

2-2.1 Local. Fort Sam Houston Installation Design Guide. ETL 1110-3-491 SUSTAINABLE DESIGN FOR MILITARY FACILITIES.

2-2.2 State.

2-3 Federal Laws. The Federal laws and regulations listed in Table 2-1 form a part of this document. They are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401-9325 (202) 512 - 1800

TABLE 2-1 – FEDERAL LAWS & REGULATIONS	
CFR/USC No.	Description
P.L. 102-486	Energy Policy Act of 1992
10 CFR 430	National Appliance Energy Conservation Act (NAECA)
10 CFR 435	Voluntary Performance Standards for New Commercial and Multi-Family High Rise Residential Buildings; Mandatory for Federal Buildings.
10 CFR 436	Methodology and Procedures for Life Cycle Cost Analyses
16 CFR 1630	Standard for Surface Flammability of Carpet and Rugs
40 CFR 247.12	Comprehensive Procurement Guideline for Products Containing Recovered Materials, Construction Products
40 CFR 280	Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
49 CFR 192	Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards
49 CFR 195	Transportation of Hazardous Liquids by Pipeline
24 USC 5301	Public Law 93-383, Community Development
42 USC 4321-4361	National Environmental Policy Act (NEPA)

TABLE 2-1 – FEDERAL LAWS & REGULATIONS	
CFR/USC No.	Description
42 USC 4901-4918 & 49 USC 1431	Noise Control Act of 1972
Army Regulation 200-1	Environmental Protection and Enhancement, May 1990
E.O. 13123	Energy Efficiency and Water Conservation in Federal Facilities

2-4 Federal Specifications and Standards. The specifications listed form a part of this document to the extent specified herein. Federal Standard 795, Uniform Federal Accessibility Standards, and federal specifications are available from the Commanding Officer, Naval Publications and Forms Center, ATTENTION: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120-5099.

2-5 Other Government Documents and Publications. The following Government documents and publications form a part of this document to the extent specified herein:

2-5.1 Americans With Disabilities Act Accessibility Guidelines, are available from U.S. Architectural and Transportation Barriers Compliance Board, 1331 F Street, N.W., Washington, D.C. 20004-1111

2-5.2 Federal Emergency Management Agency, Mitigation Directorate; 500 C Street, SW; Washington DC 20472: National Performance Criteria for Tornado Shelters and FEMA 320, Taking Shelter from the Storm: Building a Safe Room Inside Your Home. <http://www.fema.gov/>

2-5.3 NBS Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program. Available from the National Institute of Science and Technology, formerly National Bureau of Standards (NBS).

2-5.4 Standard for the Surface Flammability of Carpets and Rugs; and (Unnumbered) Handbook for Public Playground Safety, CFR 16-1630. Available from the Consumer Product Safety Commission, Directorate for Compliance and Administrative Litigation, Department of Regulatory Development, Washington, DC 20207, (301) 492-0626 or 492-0400.

2-5.5 United States Environmental Protection Agency criteria are available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4650: EPA/600/8-88/087, Radon-Resistant Residential New Construction; EPA/625/5-88/024, Application of Radon Reduction Methods; and EPA/625/5-87/019, Radon Reduction Techniques for Detached Houses.

2-6 Non-Government Publications. The following publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the Department of Defense Index of Specifications and Standards (DODISS).

2-6.1 Air Conditioning Contractors of America, Inc. (ACCA). 1712 New Hampshire Ave. NW. Washington DC 20009; (202) 483-9370; FAX (202) 588-1217; <http://www.acca.org/>.

2-6.2 Air-Conditioning and Refrigeration Institute (ARI). Information listed below is available from ARI, 4301 Fairfax Dr., Suite 425, ATTN: Pubs Dept., Arlington, VA 22203, Ph: 703-524-8800, Fax: 703-528-3816, Internet E-Mail: ari@dgsys.com, Directory of Certified Unitary Air Conditioners, Unitary Heat Pumps and Sound Rated Outdoor Unitary Equipment; ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment: <http://www.ari.org/>

2-6.3 AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA), AMCA 210, Laboratory Methods of Testing Fans For Rating, is available from AMCA, 30 West University Drive, Arlington Heights, IL 60004, (312) 394-0150: <http://www.amca.org/>

2-6.4 American Architectural Manufacturers Association (AAMA). AAMA specifications shown in Table 2-2 are available from AAMA, 1540 East Dundee Rd., Suite 310, Palatine, IL 60067-8321, Ph: 708-202-1350, Fax: 708-202-1480 2700 River Road, Suite 118, Des Plaines, IL 60018, (312) 699-7310.

TABLE 2-2 - AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION SPECIFICATIONS

No.	Description
AAMA 101	Voluntary Specification for Aluminum Prime Windows and Sliding Glass Doors
AAMA 101V	Voluntary Specification for Poly (Vinyl Chloride) (PVC) Prime Windows and Sliding Glass Doors
AAMA 1002.10	Voluntary Specifications for Aluminum Insulating Storm Products for Windows and Sliding Glass Doors
AAMA 1402	Standard Specifications for Aluminum Siding, Soffit, and Fascia

2-6.5 American Gas Association (AGA). Standards and specifications are available from AGA, 1515 Wilson Blvd., Arlington, VA 22209, Ph: 703-841-8556, Fax: 703-841-8406: <http://www.aga.org/>

2-6.6 American National Standards Institute, Inc. (ANSI). Copies of the standards listed in Table 2-3 are available from ANSI, 11 West 42nd St., New York, NY 10036, Ph: 212-642-4900, Fax: 212-302-1286: <http://www.ansi.org/>

TABLE 2-3 - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS

Std. No.	Std. Description
A112.19.1	Enameled Cast Iron Plumbing Fixtures
A112.19.2	Vitreous China Plumbing Fixtures (DoD Adopted)
A112.19.3	Stainless Steel Plumbing Fixtures (Designed for Residential Use)
A112.19.4	Porcelain Enameled Formed Steel Plumbing Fixtures (DoD Adopted)

**TABLE 2-3 - AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
STANDARDS**

Std. No.	Std. Description
A112.19.5	Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards) (DoD Adopted)
A161.1	Recommended Construction and Performance Standards for Kitchen and Vanity Cabinets
B16.5	Steel Pipe Flanges and Flanged Fittings (DoD Adopted)
B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings (DoD Adopted)
B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes (DoD Adopted)
B31.8	Gas Transmission and Distribution Piping Systems
C2	National Electrical Safety Code
ANSI C105 AWWA A21.5	Polyethylene Encasement for Ductile-Iron Pipe Systems
Z21.10.1	Water Heaters, Gas, Volume I, Storage Type, 75,000 BTUH Input or Less
Z21.45	Flexible Connectors of Other Than All-Metal Construction for Gas Appliances
Z60.1	American Standard for Nursery Stock
Z124.1	Plastic Bathtub Units
Z124.2	Plastic Shower Receptors and Shower Stalls

2-6.7 American Plywood Association. APA B840-K-88, 303 Siding Manufacturing Specifications, are available from the American Plywood Association, P.O. Box 11700, Tacoma, WA 98411, (206) 565-6600.

2-6.8 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) documents, listed in Table 2-4, are available from ASHRAE, 1791 Tullie Cir., NE, Atlanta, GA 30329-2305, Ph: 404-636-8400 Fax: 404-321-5478 1791 Tullie Circle, N.E., Atlanta, GA 30329, (404) 636-8400: <http://www.ashrae.org/>

**TABLE 2-4 – AMERICAN SOCIETY OF HEATING, REFRIGERATION,
AND AIR-CONDITIONING ENGINEERS (ASHRAE)**

No.	Description
ASHRAE -	Handbook of Fundamentals
ASHRAE -	Residential Cooling Load Calculations
ASHRAE 62	Ventilation for Acceptable Indoor Air Quality

**TABLE 2-4 – AMERICAN SOCIETY OF HEATING, REFRIGERATION,
AND AIR-CONDITIONING ENGINEERS (ASHRAE)**

No.	Description
ASHRAE 52	Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter
ASHRAE 111	Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems

2-6.9 American Society of Mechanical Engineers (ASME). ASME B16.11, Forged Fittings, Socket-Welding and Threaded, and ASME B31.8, Gas Transmission and Distribution Systems, are available from ASME, 22 Law Dr., Box 2300, Fairfield, NJ 07007-2900, Ph: 800-843-2763, Fax: 201-882-1717: <http://www.asme.org/>

2-6.10 American Society of Sanitary Engineers (ASSE). ASSE 1006, Residential Use (Household) Dishwashers, and ASSE 1008, Food Waste Disposal Units, Household, are available from ASSE, AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE), P.O. Box 40362, Bay Village, OH 44140, Ph: 216-835-3040, Fax: 216-835-3488:

2-6.11 American Society for Testing and Materials (ASTM). ASTM specifications listed in Table 2-5 are available from ASTM, AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) 1916 Race St., Philadelphia, PA 19103, Ph: 215-299-5585, Fax: 215-977-9679: <http://www.astm.org/>

**TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
SPECIFICATIONS**

Spec. No.	Spec. Description
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
A526	Specification for Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality (DoD Adopted)
B117	Method of Salt Spray (Fog) Testing (DoD Adopted)
C90	Specification for Hollow Load-Bearing Concrete Masonry Units (DoD Adopted)
C216	Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) (DoD Adopted)
D3676	Rubber Cellular Cushion Used for Carpet or Rug Underlay
D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft 2700kN-m/m)
D1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 (DoD Adopted)

**TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
SPECIFICATIONS**

Spec. No.	Spec. Description
D2513	Standard Specification for Thermoplastic Gas Pressure Piping (DoD Adopted)
D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing (DoD Adopted)
D2846	Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold-Water Distribution Systems (DoD Adopted)
D3018	Specification for Class A Asphalt Shingles Surfaced with Mineral Granules (DoD Adopted)
D3679	Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding
E84	Standard Test Method for Surface Burning Characteristics of Building Materials (DoD Adopted)
E90	Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions (DoD Adopted)
E108	Standard Methods of Fire Tests of Roof Coverings
E119	Standard Methods of Fire Tests of Building Construction and Materials
E162	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source (DoD Adopted)
E283	Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
E330	Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
E336	Standard Test Method for Measurement of Airborne Sound Insulation in Buildings
E547	Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential
E648	Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source
E779	Measuring Air Leakage by the Pressurization Method
E1007	Standard Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
E1465	Standard Guide for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings

**TABLE 2-5 - AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
SPECIFICATIONS**

Spec. No.	Spec. Description
F1292	Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment
E1423	Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems
E 1554	Determining External Air Leakage of Air Distribution Systems by Fan Pressurization.
F 1066	Standard Specification for Sheet Vinyl Composition Floor Covering
F1487-98	Standard Consumer Safety Performance Specification for Playground Equipment for Public Use
G90	Standard Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

2-6.12 American Water Works Association, Inc. (AWWA). Specifications listed below are available from AWWA, 6666 West Quincy, Denver, CO 80235, Ph: 800-926-7337, Fax: 303-795-1989, AWWA C500, Gate Valves for Water and Sewerage Systems (DoD adopted); AWWA C502, Dry-Barrel Fire Hydrants; and AWWA C503, Wet-Barrel Fire Hydrants: <http://www.awwa.org/>

2-6.13 Associated Air Balance Council (AABC). AABC MN-1, National Standards for Total System Balance, is available from AABC, 1518 K St., NW, Washington, DC 20005, Ph: 202-737-0202, Fax: 202-638-4833: <http://www.aabchq.com/>

2-6.14 American Association of Textile Chemists and Colorists (AATCC). AATCC 134, Electrostatic Propensity of Carpets, is available from AATCC, P.O. Box 12215, Research Triangle Park, NC 27709, (919) 549-8141.: <http://www.aatcc.org/>

2-6.15 Builders Hardware Manufacturers Association, Inc. (BHMA). Specifications shown in Table 2-6 are available from the Builders Hardware Manufacturers Association, Inc. (BHMA), 355 Lexington Ave., New York, NY 10017, Ph: 212-661-4261, FAX: 212-370-9047.

**TABLE 2-6 - BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
SPECIFICATIONS**

No.	Description (Specs. are DoD Adopted)
ANSI/A156.1	Butts and Hinges
ANSI/A156.4	Door Controls, Closers
ANSI/A156.5	Auxiliary Locks and Associated Products
ANSI/A156.2	Bored and Preassembled Locks and Latches

**TABLE 2-6 - BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
SPECIFICATIONS**

No.	Description (Specs. are DoD Adopted)
ANSI/A156.12	Interconnected Locks and Latches

2-6.16 Building Officials & Code Administrators International, Inc. (BOCA). The BOCA National Building Code is available from Building Officials & Code Administrators International, Inc., (BOCA), 4051 W. Flossmoor Rd., Country Club Hills, IL 60478-5795, Ph: 708-799-2300, Fax: 708-799-4981: <http://www.boca.org/>

2-6.17 Carpet and Rug Institute (CRI). CRI Standard for Installation of Commercial Textile Floor Covering Materials, CRI 104, is available from the Carpet and Rug Institute, 310 Holiday Ave. P.O. Box 2048, Dalton, GA 30722-2048, Ph: 706-278-0232: <http://www.carpet-rug.com/>

2-6.18 deleted (AM#3)

2-6.19 Electronic Industries Association Telecommunications Industry Association (EIA/TIA). EIA/TIA Standard EIA/TIA-570, is available from Electronic Industries Association, Engineering Department, Order From: Global Engineering Documents, 7730 Carondelet Ave., Suite 407 Clayton, MO 63105, Ph: 800-854-7179, or 714-979-8135, Fax: 314-726-6418

2-6.20 Illuminating Engineering Society of North America (IESNA). The IESNA Lighting Handbook, is available from Illuminating Engineering Society of North America, (IESNA), 120 Wall St., 17th Floor, New York, NY 10005-4001, Ph: 212-248-5000, Fax: 212-248-5017: <http://www.iesna.org/>

2-6.21 **International Conference of Building Officials (ICBO). The 2000 International Building Code and 2000 International Residential Code are available from the, INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO), 5360 S. Workman Mill Rd., Whittier, CA 90601-2298, Ph: 800-252-3602, Fax: 913-764-2272: <http://www.icbo.org/> (AM#3)**

2-6.22 National Association of Architectural Metal Manufacturers Association (NAAMA). NAAMA Metal Finishes Manual, is available from the NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM), 11 So. LaSalle St., Suite 1400, Chicago, IL 60603, Ph: 312-201-0101, FAX: 312-201-0214:

2-6.23 National Association of Corrosion Engineers (NACE). NACE RP-0286, The Electrical Isolation of Cathodically Protected Pipelines, is available from NACE, P.O. Box 218340, Houston, TX 77218: <http://www.nace.org/>

2-6.24 **International Code Council (ICC). The International Plumbing Code, 5203 Leesburg Pike, Suite, 708, Falls Church, VA 22041-3401, 703-931-4533 [AM#0003].**

2-6.25 National Electrical Manufacturers Association (NEMA). NEMA standards listed below are available from the National Electrical Manufacturers Association (NEMA), NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA), 2101 L St., NW, Suite 300, Washington, DC 20037-1526 Ph: 202-457-8474 Fax: 202-457-8473 NEMA DC 3, Wall-Mounted Room Thermostats; and NEMA WD 1, General Requirements for Wiring Devices: <http://www.nema.org/>

2-6.26 NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), NEBB-01, Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems, is available from NEBB, 875 Grove Mount circle, Gaithersburg, MD 20877-4121, Ph: 301-977-3698, Fax: 301-977-9589: <http://www.nebb.org/>

2-6.27 National Fenestration Rating Council (NFRC). NFRC 100-91, Procedure for Determining Fenestration Product Thermal Properties, is available from NFRC, 1300 Spring Street, Suite 500, Silver Spring, MD. Telephone: (301) 589-NFRC, <http://www.nfrc.org>

2-6.28 National Fire Protection Association, Inc. (NFPA). NFPA codes listed in Table 2-7 are available from the National Fire Protection Association, Inc. (NFPA), 1 Battery March Park, P.O. Box 9101, Quincy, MA 02269. Telephone: (617) 770-3000, Fax: (617) 770-0700: <http://www.nfpa.org/>

**TABLE 2-7 - NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
CODES**

Code No.	Code Description
NFPA 13	Installation of Sprinkler Systems
NFPA 13R	Installation of Sprinkler Systems in Residential Occupancies Up To and Including Four Stories
NFPA 54	National Fuel Gas Code
NFPA 70	National Electrical Code (DoD Adopted)
NFPA 72	National Fire Alarm Code
NFPA 101	Life Safety Code
NFPA 101M	Alternative Approaches to Life Safety
NFPA 255	Method of Test of Surface Burning Characteristics of Building Materials
NFPA 501A	Manufactured Home Installations
NFPA 501D	Recreational Vehicle Parks and Campgrounds
NFPA 701	Standard Methods of Fire Tests for Flame Resistant Textiles and Films

2-6.29 National Sanitation Foundation, 3475 Plymouth Road, Ann Arbor, MI 48105. Telephone: (313) 769-8010, Fax: (313) 769-8010: <http://www.nsf.org/>.

2-6.30 National Wood Window and Door Association (NWWDA) standard, NWWDA I.S.2, Standard for Wood Window Units is available from the National Wood Window and Door Association (NWWDA), 1400 East Touhy Ave., Suite 470, Des Plaines, IL 60018, (847) 299-5200, Fax: (847) 299-1286: <http://www.nwwda.org/>.

2-6.31 Sheet Metal and Air Conditioning Contractors National Association (SMACNA). SMACNA Installation Standards for Residential Heating and Air Conditioning Systems and SMACNA-07, HVAC Systems, Testing, Adjusting, and Balancing, are available from SMACNA, 4201 Lafayette Center Drive, Chantilly, VA 22180, (703) 803-2980, Fax: (703) 803-3732: <http://www.smacna.org/>

2-6.32 Southern Building Code Congress International, Inc. The Standard Housing Code is available from Southern Building Code Congress International, Inc., 900 Montclair Road, Birmingham, AL 35213-1206. Telephone: (205) 5921-1853, Fax: (205) 591-9775: <http://www.sbcci.org/>.

2-6.33 Underwriters Laboratories, Inc. (UL) specifications listed in Table 2-8 are available from the Underwriters Laboratories, Inc. (UL), 333 Pfingston Road, Northbrook, IL 62096. Telephone: (847) 272-8800. Fax: (847) 509-6220: <http://www.ui.com/>.

TABLE 2-8 – UNDERWRITERS LABORATORIES SPECIFICATIONS

No.	Description (Specs. Are DoD Adopted)
UL 174	Water Heaters, Household Electric Storage Tank Type
UL 430	Waste Disposers
UL 507	Electric Fans
UL 555	Fire Dampers
UL 746C	Polymeric Materials - Use in Electrical Equipment Evaluations
UL 749	Household Dishwashers
UL 858	Household Electric Ranges
UL 923	Microwave Cooking Appliances
UL 900	Test Performance of Air Filter Units

3. SITE PLANNING AND DESIGN.

3-1 Scope. This project consists of **70** housing units with site amenities on **17.2 hectares (42.6 acres)** of land area. Of the 70 units, 20 will be designed for Sr. Non-Commissioned Officers (NCO) and 50 for Jr. NCOs. **Site amenities include, but are not limited to, the construction of new residential streets and the replacement of existing streets, as directed in the RFP, recreational features, sidewalks, utilities and drainage. (AM#4)** Imaginative site design is encouraged, however, the site boundaries, project composition, and gross density are fixed. Based on the graphic and narrative description of site opportunities and constraints provided, the offeror shall verify that the site meets the program requirements.

3-2 REFERENCES.

The design of this facility shall comply with the requirements of the applicable parts of the following references:

CESWD Architectural and Engineering Instruction Manual (CESWD-AEIM)

Uniform Federal Accessibility Standards, Federal Register (UFAS)

Americans with Disabilities Act Guidelines (ADA)

TM 5-803-5, Installation Design

TM 5-803-14, Site Planning and Design

TM 5-813-5, Water Supply, Water Distribution Systems

TM 5-814-1, Sanitary and Industrial Wastewater Collection- Gravity Sewers and Appurtenances

TM 5-814-2, Sanitary and Industrial Wastewater Collection- Pumping Stations and Force Mains

TM 5-820-4, Drainage for Areas Other Than Airfields

TM 5-822-2, General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas

TM 5-822-5, Pavement Design for Roads, Streets, Walks, and Open Storage Areas

TM 5-822-7, Standard Practice for Concrete Pavements

TM 5-848-1, Gas Distribution

DG 1110-3-204, Design Guide for Army and Air Force Airfields, Pavements, Railroads, Storm Drainage, and Earthwork

MIL-HDBK-**1008C** (AM#4), Fire Protection for Facilities

MIL-HDBK-1190, Facility Planning and Design Guide

HQUSACE Architectural and Engineering Instructions- Design Criteria (USACE AEI)

3-3 Area Development Plan. Provide a housing area development plan that shows the spatial and functional arrangement of all housing requirements. The plan should ensure an economical, compatible and functional residential land use development that utilizes the advantages of the site, fosters visual order, and provides a

sense of community. The area development plan shows consideration for the site opportunities and constraints, housing program requirements, and specific site design criteria and guidance provided. The recommendations of the Installation Real Property Master Plan and Installation Design Guide should be addressed.

3-3.1 Density. The project site is approved for LOW DENSITY siting. Land area for density calculations excludes slopes greater than 10 percent, major highways, flood plains and flood areas, lakes and water courses. Designated major recreation areas greater than 1.2 ha [3 acres] may be excluded from the density calculation.

3-3.2 Land use. The plan for the area should reflect an optimum balance of housing unit floor area, open space, play lots, recreational amenities and pedestrian and vehicular circulation. The plan should show an efficient, organized and economical land use arrangement that is compatible and functional. This plan should show the relationship of the area to adjacent land uses.

3-3.3 Noise. Use mitigation techniques to moderate predictable noise in accordance with the Installation Compatible Use Zone Program. All possible methods of mitigating the impact to the site and adjacent areas should be explored.

3-3.4 Buffer area. Provide appropriate buffer areas to separate and visually isolate the community from undesirable external influences and to separate adjacent officer and enlisted personnel housing areas from each other. The width of a street should be a minimum acceptable buffer zone between officer and enlisted personnel housing areas. Buffer areas may be used for recreational amenities, such as basketball courts, tot lots and trees. All possible methods of mitigating the impact to the site and adjacent areas should be explored. Buffer screening is desired along the southern and eastern boundaries of the site to separate the housing area from industrial and troop areas, respectively. Landscaping or berming is the desired method of screening.

3-3.5 Housing unit grouping. Variety in groupings, arrangements, and siting configurations of housing units is encouraged to fit varying terrain conditions and to provide compatible and functional residential layouts and street scapes. Building arrangements should be informal and imaginative with setbacks and orientation to provide for the best view, privacy, and variety. The proper grouping of housing units will provide backyard screening, separation of pedestrian and vehicular traffic, play lots and natural open spaces. The layout should reflect simplicity of design and provide a visual sense of community and should mirror the density and style reflected in the existing Patch-Chaffee housing area but does not limit the layout to a strictly linear configuration.

3-3.6 Housing unit variation. Housing unit variation shall afford distinctly different exterior appearances within each housing unit type. Provide stylistic compatibility that will give the neighborhood a sense of order. Housing units shall vary in two or more of the following: Floor plans, massing, elevation, carport location, and exterior materials. One floor plan for each housing unit type is acceptable if sufficient variety is achieved by means of other variations mentioned above. In addition, housing units shall vary in color and siting. A reverse floor plan (mirror-image), although an acceptable means of creating variety, shall not constitute a housing unit change. Offerors shall comply with land-use restraints set forth in this document. Five percent of the units shall be handicapped accessible and shall meet the requirements of the Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act (ADA) and should be located at the northern portion of the site bound by Patch, Chaffee and W.W. White Roads (north of unit 881 and east of units 831 to 834). This would result in one (1) Sr. NCO unit and three (3) Jr. NCO units being handicapped accessible. The design should reflect life cycle maintenance and energy efficiency.

3-3.7 Housing unit orientation. Housing units shall be oriented, to the maximum extent possible within the constraints of the site available, so that a major section of the roof faces within 20 degrees of South. The purpose of proper orientation is to expose a minimum surface area to direct solar gain while allowing the units the potential for passive solar applications. Additional consideration will be given during the quality evaluations with respect to unit orientations and passive solar applications considered and included. For additional passive solar information and considerations, see paragraph 11- ENERGY CONSERVATION, of this Statement of

Work.

3-3.8 Grading. The grading should maintain existing topography while recognizing standard gradients for the housing units and various functions. If feasible, there should strive to be a balance of the quantity of cut and fill, which would create a smooth transition of graded areas into the existing natural site. The plan should reflect selective site clearing that preserves groups of trees, where applicable. Grading should manage site runoff. The principles of positive drainage should be applied to control the conditions that remove rainfall away from facilities and functions.

3-3.8.1 Turfed Areas. In any turfed area, the minimum slope shall be 2%. In housing unit backyards, the maximum slope shall be 3%. In other areas the finished grade should slope away from the buildings at 5% for at least 3 meters. In areas outside of housing unit yards, turfed slopes may vary between 2% minimum and a maximum of 25%, however the maximum slope should be avoided, if possible. Should slopes in excess of 25% be required, slope protection such as slope paving, should be employed or retaining walls shall be used to effect grade changes.

3-3.8.2 Roads, Streets, Access Drives and Parking Areas. Longitudinal grade changes in excess of 1% shall be accomplished by vertical curves. Profiles are mandatory for vertical control of centerline gradients.

3-3.8.3 Parking Areas. Pavement grades shall provide positive drainage with a 1% minimum slope in the direction of drainage. The maximum slope in the direction of parking shall be 1-1/2%. The slope perpendicular to the direction of parking shall be 5% maximum for bituminous or concrete surfaces and 3% for other surfaces.

3-3.8.4 Sidewalks. Sidewalks with a slope gradient equal to or less than 3% are preferred. Sidewalk transverse cross-slope shall be a 2% minimum with a maximum no greater than 5%. Any walkway with a slope greater than 4.2% shall be designated as a ramp. Sustained walkway grades greater than 3.3% shall have a level landing of at least 1.83m x 1.83m (6 ft x 6ft) at 18.3m (60 ft) intervals for rest and safety. Walks and ramps serving facilities that are accessible to and usable by the physically handicapped shall meet the requirements of UFAS and ADA.

3-4 Site Design Criteria. The following specific criteria, based on site density, are to be used as guidance in site design, and proposals will be **evaluated AM#4)** accordingly.

3-4.1 Housing units per hectare (ha) [acre (ac)] by site density are shown in Table 3-1 on the following page.

Pay Grade	Low Density	
	units/ha	units/ac
E-6 & Below	9.9-17.3	4-7
E-7 - E-9	7.4-12.4	3-5

3-4.4 Parking requirements by site density.

3-4.4.1 Low density: Two off-street stalls and one guest on-street stall per unit.

3-4.5 Children's outdoor play areas. Children's outdoor play areas are a requirement per number of housing units. See paragraph 3-7 for size and equipment specifications.

3-4.5.1 Play lot: One 325 m² [3,500 ft²] play lot per 30 housing units. The play lot shall be designed to accommodate two age groups; 12 months to 5 years age group and 5 to 9 years age group. The play lot shall

have a capacity for approximately 15 to 35 children. These play lots should be located within site lines of the housing units and in close proximity to the Jr. NCO units.

(AM#5)

3-4.6 Site amenities Additional site amenities to be included in the design include picnic tables and grills at the play lots, half-court basketball courts and walks. New walks shall be located only on one side of the street and shall be designed to connect the new housing area to both new and existing amenities. The amenities should be sited so as to provide easy access to the units that will be located at the site boundaries.

3-5 Building Setbacks and Spacing. Clearances between and adjacent to buildings must consider requirements for fire protection, safety, privacy, and emergency access in addition to the following minimum criteria. Setback or yard dimensions shall be from the building wall to an imaginary lot line around each building measured perpendicular to the building. Wall lengths with horizontal offsets of 1.8 m [6 ft] or more may be measured separately when determining yard depth. Distance between buildings shall be not less than the sum of setbacks or yards, as required.

3-5.1 Minimum setbacks and spacing for low density sites is shown in Table 3-4.

TABLE 3-4 - MINIMUM SETBACKS AND SPACING, LOW DENSITY SITES

Description	Meters	[Feet]
From front of house to curb of residential street.	7.5	25
From house to major/arterial highway. (Edge of pavement)	45.0	150
From house to collector street. (Edge of pavement)	30.0	100
Side of carport (AM#4) to curb.	6.0	20
Side of house to curb ¹ .	6.0	20
Between sides of carports (AM#4) and houses ¹ .	1.5	5
Between outside walls of houses ¹ .	6.0	20
Between rear walls of houses.	24.0	80
Between side and rear walls of houses.	12.0	40
Between street face of carport (AM#4) and curb or sidewalk when second off- street parking space is next to (AM#4) carport.	2.4	8
Between street face of carport (AM#4) and curb or sidewalk when second off- street parking space is between carport (AM#4) and street.	8.5	28

Note¹: When patios are located within a yard, separation shall not be less than 12.0 m [40 ft].

3-5.3 Setback Notes.

3-5.3.1 Where the slope is 3:1 or steeper, top and toe of slope shall be a minimum of 4.5 m [15 ft] from the building.

3-5.3.2 Courts, outer and inner, shall have dimensions not less than the sum of the required yard distances. An inner court shall have a minimum area of 9.29 m² [100 ft²] for a one-story building.

3-6 **Circulation and Parking (AM#4)**. The vehicular and pedestrian circulation system shall promote safe, efficient movement of vehicles and pedestrians within the housing area. It should maintain the maximum separation of vehicles and pedestrians. Safe circulation systems have a clear hierarchy of movement, lead to a clear destination, and do not interrupt other functions. The following criteria shall be considered for designing streets and drives for vehicles and pedestrians:

3-6.1 Vehicular circulation. Vehicular circulation layout is determined by applying the design vehicle templates to the site design. The passenger car class includes passenger cars and light delivery trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational - privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor-semitrailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Templates showing the turning movements for design vehicles are provided by the American Association of State Highway and Transportation Officials (AASHTO). Design site entrances, exits, service drives, and special circulation areas to accommodate the largest vehicle that uses the area. In the case of family housing the largest vehicle to use the area on a weekly basis would be the 12 m (40 ft) garbage truck. Provide the vehicle clearances that are required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Streets shall include required traffic control and street identification signage, maximum spacing between drives, right-angle turns, and limit points of conflicts between traffic.

3-6.1.1 Definitions.

3-6.1.1.1 Nonresidential Streets

3-6.1.1.1.1 Arterial. Major roads and street systems external to the residential area.

3-6.1.1.1.2 Collector. Feeder street connecting external street system with residential streets in the subdivision and adjoining areas subject to future development. No houses shall be located on collector streets, and no driveway or access shall be from collector streets

3-6.1.1.2 Residential Streets

3-6.1.1.2.1 Loop. Both ends open to traffic.

3-6.1.1.2.2 Cul-De-Sac. Only one end open to access street and a turnaround (T, Y, or Circle) at the other end.

3-6.1.2 Cul-De-Sac Design. The circulation system may be based on cul-de-sacs a maximum 182.8 m [600 ft] long, measured from the center of the cul-de-sac to the centerline of the access street.

3-6.1.3 Intersection Design. Provide "T" intersection offsets of at least 38.1 m [125 ft]. The preferred angle of intersection is right-angle (90 degrees).

3-6.1.4 Street design. Street dimensions are determined by the selected design vehicle templates. Separation, corner clearances, and sight distance are established when the design vehicle templates and speed limits are selected. Streets shall be designed for vehicles with not less than 2721.5 kg [6,000 lb] code wheel load. Pavement shall be asphaltic concrete as described in the furnished **Attachment 7A-GEOTECHNICAL REPORT (AM#5)**. The Installation desires that Road No. S-23 is utilized for the whole run

of the community. **Replace Road No. S-23 between Lawton and Crockett Roads. Replace the street located one block east of Road No. S-23, between Harney and Schofield Roads. This street may be rerouted, as deemed necessary. (AM#4).** Streets shall be provided with standard barrier type reinforced concrete curbs and gutters. Reinforcement shall be #10M bars. Turning **radii** on streets and service roads shall be designed to accommodate a fire department ladder truck. Curbs shall be depressed at entrances to driveways. All gradients shall provide positive drainage with no ponding. Longitudinal street grades shall vary between 0.3% minimum and 6% maximum. Vertical curves shall be provided where longitudinal grade changes equal 1% or more.

3-6.1.5 Housing unit access drive. Access drives should provide traffic safety distances which allow safe entry and exit. Access drives serving more than 8 housing units, or subject to service and emergency truck traffic shall be designed as a street.

3-6.2 Privately owned vehicle (POV) parking. POV stalls without vehicle overhang shall be a maximum 2.7 m x 5.5 m [9 ft x 18 ft]. The design vehicle template that is used to design this space shall be described. Design on-street parking stalls to be of sufficient length and width to allow safe movement into and out of the stall and to adequately separate the parked vehicle from the traffic flow. On-street parking will not be allowed on service roads. Signage should be provided which reflects this requirement. Provide compact passenger car dimensions only when recommended by a Site Traffic Impact Study.

3-6.2.1 Housing unit POV parking. POV parking areas consisting of more than 4 vehicles backing into the street are unacceptable.

3-6.2.2 Off-street parking lots. A 90-degree parking layout is preferable. Maintain two-way movement and avoid dead-end parking lots. Provide more than one entrance and exit drive. In large parking lots provide a minimum 10 percent of the total paved area for landscape plant material.

3-6.3 Deleted (AM#4)

3-6.4 Pedestrian circulation. Pedestrian circulation should be safe, separated from vehicle circulation, and relate to the housing units, parking, and community facilities. Pedestrian circulation should be based on pedestrian desired lines of walking between facilities. Desired lines should be weighted to predict the most traveled routes. These routes would require paving. Topography and vegetation can be used to reinforce a sense of movement. Design pedestrian concentration areas with adequate paved area.

3-6.4.1 Sidewalk design. Sidewalks shall be provided on one side of the street. Walks shall be a minimum of 1.22 m [4 ft] wide (except for those in the vicinity of the handicapped accessible units and accessible site amenities) exclusive of curb width, and made of nonreinforced concrete with a minimum thickness of 100 mm [4 in]. Walks in the vicinity of the handicapped accessible units and accessible site amenities shall be designed as specified in UFAS and ADA. Where walks are adjacent to the curb, the curb width is not to be included as sidewalk. Ramps for handicapped individuals shall be provided at intersections by depressing street curbs and adjacent sidewalk and shall meet the requirements specified in UFAS and ADA. Concrete construction shall also apply to porches, patios, stoops and walks unit entrances.

3-6.5 Signs. Locate all proposed signs on a site plan in accordance with distance and placement guidelines. The signing system should provide consistency and continuity to the overall visual image of the installation. The signs shall be coordinated with the design of other site furnishings to minimize the number of streetscape elements and reduce clutter.

3-6.5.1 Traffic signs. Traffic signs shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highway Administration.

3-7 Children's Outdoor Play Areas. The design of the children's outdoor play areas shall comply with the safety requirements of ASTM F 1487 and ASTM F 1292. The children's outdoor play areas are unsupervised

play areas and do not have a supervised play program for child development. These areas are not part of trained recreation, youth center or child development staff support. Supervised outdoor play areas occur at youth centers and child development centers.

3-7.1 Child Safety and Accessibility.

3-7.1.1 Accessibility to children and adults with disabilities. Play areas shall be accessible to children and adults with disabilities. In addition to wheelchair users, the needs of children and adults who walk with canes, walkers, or crutches; who have limited use of the upper body; who have visual or hearing disabilities, or who have developmental disabilities shall be considered. Design criteria based on child dimensions should be used for the proper functioning of the play area. Every part of a play area may not be accessible to all its users, but the social experience provided should be accessible to everyone. When more than one play activity of the same type is provided, one shall be accessible. When one activity is provided, it shall be accessible. A diverse play area has the greatest potential for meeting the needs of all users. Separate play areas for the physically challenged are not acceptable. Integrating all children in the same play setting will be emphasized. Guidelines available from this design district for accessible routes, ramps for wheelchair access, transfer points, wheelchair accessible platforms, and accessible stepped platforms should be followed.

3-7.1.2 Age appropriate scale. Age appropriate scale is a term used to describe equipment which will allow safe and successful use by children of a specific chronological age, mental age, and physical ability. Play equipment height and complexity will not exceed the user's ability. The children's outdoor play areas will meet age appropriate scale for the age groups that the areas are designed to accommodate.

3-7.1.3 Use zones. In accordance with ASTM F 1487, a use zone is a clear, unobstructed area under and around play equipment where a child would be expected to land when jumping or falling from a piece of play equipment. These zones require a playground safety surface in accordance with ASTM F 1292. Requirements for use zones vary for the age group and for different pieces of equipment. All use zones for play equipment should be shown on the site plan to ensure there is no conflict between play activities on the ground and swinging or jumping from the equipment. Use zones will not overlap except for spring rocking equipment, balance beams, and play houses.

3-7.1.4 Playground safety surface. A playground safety surface is constructed of a material that meets the shock absorbency criteria recommended in ASTM F 1292. Playground safety surfaces shall be provided throughout all use zones and under all play equipment as required.

3-7.1.5 Inappropriate play events. The following play events are not appropriate for use in unsupervised play areas: Chain walks, chain or tire climbers, fulcrum seesaws, log roles, May poles, merry-go-rounds, rotating equipment, spring rocking equipment intended for standing, swinging exercise bars, trapeze bars, and whirls.

3-7.2 Play lot. Provide play lots that are located within the site lines of the housing units to be supported. Connect play lots to the units by a walkway system that meets the requirements as specified for sidewalks above. Provide shade. Each play lot shall be provided with the following age appropriate play events and equipment for the two age groups to be accommodated:

3-7.2.1 Pathway. The pathway should encompass the perimeter of the area, accommodate wheeled toys, and consist of different textures, colors, and patterns for games.

3-7.2.2 Gathering place. This setting provides an open space for groups of different sizes and people of all ages. Provide an infant crawl area. The seating materials may include boulders, timbers or logs arranged with vegetation to create a room like atmosphere. A shelter may be provided.

3-7.2.3 Sand play setting. This setting supports creative play and social interaction. It provides children with a manipulative play environment. The play elements include sand, water, sand tables, containment barriers and boulders. The sieve size for sand should consist of a fine washed plaster sand. The sand used here is not the same sieve size as the sand used for the use zones. This setting should be located adjacent to the play

village.

3-7.2.4 Play village. This setting supports a playhouse and a water source. It should be located adjacent to the sand play setting.

3-7.2.5 Dramatic play setting. This setting supports dramatic play elements such as playhouses, play platforms, and an open area for seating on the ground.

3-7.2.6 Manufactured play equipment setting. This setting includes an age appropriate composite structure consisting of multiple play events for each of the following age groups; 12 months to 2 years of age, 2 to 5 years of age and 5 to 9 years of age. Other play events include freestanding equipment such as spring rocking equipment, swing, and balance beam. The swing should be located as a freestanding play event on the perimeter.

3-7.3 Sports and games areas. Provide half-court basketball courts. Other design elements include asphalt surfacing, fences, drinking fountains, lighting, seating and trash receptacles.

3-7.4 Plant materials. Plants and ground cover should be integrated into play settings. Plants provide a variety of learning opportunities, as they become a source for play material for crafts, dramatic play, and sensory experience. Plants define space and provide shade. Poisonous plants and plants with thorns are not allowed and should be removed from the play areas.

3-8 Landscape Planting Plan. The offeror shall obtain and use the services of a qualified landscape architect, experienced in site planning and planting design. A complete, integrated landscape planting plan incorporating the Fort Sam Houston Landscape Master Plan shall be provided for the overall housing project. The design shall reflect appropriate groupings, and street tree plantings to define the open spaces to ensure a complete landscaped project. Undesirable views shall be screened from the housing units and play areas. **Housing will have screening along the southern and eastern boundaries of the site to screen the housing areas from industrial and troop areas, respectively (AM#5).** The screening may be accomplished through the use of landscaping, berms or a combination of the two. The screening shall be at least 50% effective when installed and should be designed offer a minimum of 85% coverage after 3 growing seasons. Screening with fencing is not desirable. It is important that the Western border of the site be screened from the adjoining work areas. Foundation plantings for each house will not be required although a series of typical planting plans may be provided to guide the new residences in installing the foundation plantings themselves. Choose plant materials on the basis of plant hardiness, climate, soil conditions, low maintenance, and quality. Selected plant materials shall be easily maintained and tolerant of the specific site conditions. Planting or seeding shall occur only during periods when beneficial results can be obtained.

3-8.1 Trees, shrubs, and ground cover. Plant varieties shall be nursery grown or plantation grown stock conforming to ANSI/ANLA Z60.1. The varieties chosen shall be chosen from the approved list accompanying the existing master plan. They shall be grown under climatic conditions similar to those in the locality of the project.

3-8.1.1 Quality. Well-shaped, well-grown, vigorous, healthy plants having healthy and well-branched root systems shall be provided. Plants shall be free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement, and abrasion. Plants shall be provided that are typical of the species or variety, and conforming to standards as set forth in ANSI/ANLA Z60.1.

3-8.1.2 Shade and flowering trees. A height relationship to caliper shall be provided as recommended by ANSI/ANLA Z60.1. Height of branching should bear a relationship to the size and variety of tree specified, and with the crown in good balance with the trunk. Trees shall not be "poled" or the leader removed.

3-8.1.2.1 Single stem. Trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.

3-8.1.2.2 Multi-stem. All countable stems, in aggregate, shall average the size specified. To be considered a stem, there should be no division of the trunk which branches more than 150 mm [6 in] from the ground level.

3-8.1.2.3 Specimen. A plant shall be provided that is well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

3-8.1.3 Deciduous shrub. Plants shall be provided that have the height and number of primary stems as recommended by ANSI/ANLA Z60.1. An acceptable plant shall be well shaped with sufficient well-spaced side branches recognized by the trade as typical for the variety grown in the region.

3-8.1.4 Coniferous evergreen. Trees shall be provided that have the height-to-spread ratio as recommended by ANSI/ANLA Z60.1. Trees shall not be "poled" or the leader removed. An acceptable plant shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

3-8.1.5 Broadleaf evergreen. Plants shall be provided that have ratio of height-to-spread as recommended by ANSI/ANLA Z60.1. An acceptable plant shall be well shaped and recognized by the trade as typical for the variety grown in the region.

3-8.1.6 Ground cover. Plants shall be provided with the minimum number of runners and length of runner as recommended by ANSI/ANLA Z60.1. Plants shall be furnished that have heavy, well developed, and balanced top with vigorous well developed root system, and shall be furnished in containers.

3-8.1.7 Measurement. Plant measurements shall be in accordance with ANSI/ANLA Z60.1.

3-8.1.8 Percolation test. Test for percolation shall be done to determine positive drainage of plant pits and beds. All soil and drainage conditions detrimental to the growth of plant material shall be identified and a proposal correcting the conditions shall be submitted.

3-8.2 Soil test. A soil test shall be performed for pH, chemical analysis, and mechanical analysis to establish the quantities and type of soil amendments required to meet local growing conditions for the type and variety of plant material specified.

3-8.3 Installation. Verify the location of underground utilities. When obstructions below ground or poor drainage affect the planting operation, proposed adjustments to plant location, type of plant, and planting method or drainage correction shall be submitted. The plant material shall be installed during appropriate planting times and conditions recommended by the trade for the type and variety of plant material specified. Plant pits shall be excavated and backfilled as recommended by the trade and ANSI/ANLA Z60.1. The planting operation shall be performed only during periods when beneficial results can be obtained. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted.

3-8.4 Pruning. The total amount of foliage shall be pruned by one-fourth to one-third on installed trees and shrubs to compensate for loss of roots and transplanting shock. The typical growth habit of individual plants shall be retained. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3-8.5 Maintenance during planting operation. Installed plants shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences.

3-8.6 Plant establishment period. On completion of the last day of the planting operation, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect for the remaining contract time period not to exceed 12 months. When the planting operation extends over more than one season or there is a variance to the planting times, the plant establishment

periods shall be established for the work completed.

3-8.7 Maintenance during establishment period. The maintenance of plants shall include straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, accomplishing wound dressing, removing dead or broken tip growth by pruning, maintaining edging of beds, checking for girdling of plants and maintaining plant labels, watering, weeding, removing and replacing unhealthy plants.

3-8.8 Unhealthy plant. A plant shall be considered unhealthy or dead when the main leader has died back, or 25 percent of the crown is dead. Determine the cause for an unhealthy plant. Unhealthy or dead plants shall be removed immediately and shall be replaced as soon as seasonal conditions permit in accordance with the following warranty paragraph.

3-8.9 Warranty. Furnished plant material shall be guaranteed to be in a vigorous growing condition for a period of 12 months regardless of the contract time period. A plant shall be replaced one time under this guarantee. Transplanting existing plants requires no guarantee.

3-8.10 Turf. Turf consists of seed, sod, and sprigs. There may be several different types of turf mixtures applied; one for lawn areas around housing units and one for field or recreation areas. The boundaries of each area shall be clearly defined on the planting plan.

3-8.10.1 Seed quality. State approved seed of the latest season's crop shall be provided in the original sealed packages bearing the producer's guaranteed analysis for percentages of mixture, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with applicable State seed laws. Seed mixtures shall be proportioned by weight. Weed seed shall not exceed one percent by weight of the total mixture.

3-8.10.2 Sod. State approved sod shall be provided as classified by applicable State laws. Each individual sod section shall be of a size to permit rolling and lifting without breaking.

3-8.10.2.1 Quality. The sod shall be relatively free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 50 mm [2 in] in any dimension, woody plant roots, and other material detrimental to a healthy stand of turf. Sod that has become dry, moldy, or yellow from heating, or has irregular shaped pieces of sod and torn or uneven ends shall be rejected.

3-8.10.2.2 Thickness. Sod shall be machine cut to a uniform thickness of 306 mm [1ft 1/4 in] within a tolerance of 6 mm [1/4 inch] excluding top growth and thatch. Measurement for thickness shall exclude top growth and thatch.

3-8.10.2.3 Time limitation. The limitation of time between harvesting and placing sod shall be 36 hours.

3-8.10.3 Sprig quality. The cultivar shall be provided as healthy living stems, stolons, or rhizomes with attached roots, including two or three nodes, and shall be from 100 mm to 150 mm [4 in to 6 in] long, without adhering soil. Sprigs shall be provided which have been grown under climatic conditions similar to those in the locality of the project. Sprigs shall be obtained from heavy and dense sod, free from weeds or other material detrimental to a healthy stand of turf. Sprigs that have been exposed to heat or excessive drying shall be rejected. The time limitation between harvesting and placing sprigs shall be 24 hours.

3-8.10.3.1 Soil test. A soil test shall be performed for pH, chemical analysis, and mechanical analysis to establish the quantities and type of soil amendments required to meet local growing conditions for the type and variety of turf specified.

3-8.11 Temporary turf cover. When there are contract delays in the turfing operation or a quick cover is required to prevent erosion, the areas designated for turf shall be seeded with a temporary seed. When no other turfing materials have been applied, the quantity of one-half of the required soil amendments shall be

applied and the area tilled.

3-8.12 Installation. The turf shall be installed during appropriate planting times and conditions recommended by the trade for the type and variety of turf specified. The turf operations shall be performed only during periods when beneficial results can be obtained. Drainage patterns shall be maintained. The turf shall be installed by using the methods as recommended by the trade for the type and variety of turf specified.

3-8.13 Protection. Immediately after turfing, the area shall be protected against traffic or other use by erecting barricades and providing signage as required.

3-8.14 Turf establishment period. The turf establishment period for establishing a healthy stand of turf shall begin on the first day of work under the turfing contract and shall end three months after the last day of the turfing operation. An unsatisfactory stand of turf shall be repaired as soon as turfing conditions permit.

3-8.15 Satisfactory stand of turf.

3-8.15.1 Seeded lawn area. A satisfactory stand of turf from the seeding operation for a lawn area is defined as a minimum of 160 grass plants per square meter. Bare spots shall be no larger than 150 mm [6 in] square. The total bare spots shall not exceed two (2) percent of the total seeded area.

3-8.15.2 Seeded field area. A satisfactory stand of turf from the seeding operation for a field area is defined as a minimum of 100 grass plants per square meter. The total bare spots shall not exceed two (2) percent of the total seeded area.

3-8.15.3 Sodded area. A satisfactory stand of turf from the sodding operation is defined as living sod uniform in color and texture. Bare spots shall be no larger than 50 mm [2 in] square.

3-8.15.4 Sprigged area. A satisfactory stand of turf from the sprigging operation is defined as a minimum of 20 sprigs per square meter. Bare spots shall be no larger than 225 mm [9 in] square. The total bare spots shall not exceed two (2) percent of the total sprigged area.

3-8.16 Maintenance during establishment period. The maintenance of the turfed areas shall include eradicating weeds, eradicating insects and diseases, protecting embankments and ditches from erosion, maintaining erosion control materials and mulch, protecting turf areas from traffic, mowing, watering, post-fertilization, and replacing unsatisfactory turf areas.

3-9 DELETED

4. SITE ENGINEERING.

4-1 Soils.

4-1.1 Soil, Foundation and Pavement Report (Geotechnical Report). A preliminary Soil, Foundation and Pavement Report is provided as part of this RFP. A drawing indicating Subsurface Explorations and Geologic Profiles for the proposed site is also provided. The report provides an overview of soils and geologic conditions, and is furnished for informational purposes only. The offeror to whom this contract is awarded shall, with his or her consulting professional geotechnical engineer experienced in geotechnical engineering, be responsible for determining site specific geotechnical conditions.

4-1.1.1 The Contractor provided site specific geotechnical conditions report shall include, but not be limited to:

4-1.1.1.1 Classification of soil and rock.

4-1.1.1.2 Depth to bedrock.

4-1.1.1.3 Extent of boulders.

4-1.1.1.4 Bearing capacity of soil and rock.

4-1.1.1.5 Settlement potential.

4-1.1.1.6 Compaction requirements.

4-1.1.1.7 Groundwater characteristics.

4-1.1.1.8 Infiltration and permeability.

4-1.1.1.9 Erosion and siltation.

4-1.1.1.10 Surface and subsurface drainage.

4-1.1.1.11 Soil resistivity.

4-1.1.1.12 DELETED

4-1.1.2 The offeror and his or her professional geotechnical engineer consultant shall certify in writing that the design of the project has been developed consistent with the site specific geotechnical conditions. The certification shall be stamped by the consulting professional geotechnical engineer and shall be submitted with the 60 (AM#4) percent design submission. If revisions are made to the 60 (AM#4) percent design submission, a new certification shall be provided with the final design submission.

4-1.2 Soil compaction.

4-1.2.1 Soil compaction shall be achieved by equipment approved by a professional geotechnical engineer. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the compaction specified with the equipment used. Compact each layer to not less than the percentage of maximum density specified in Table 4-1, determined in accordance with ASTM D 1557 Method D.

TABLE 4-1 – SOIL COMPACTION

Subgrade Preparation, Fills, Embankments, and Backfills	Minimum Compaction Requirements (Percentage of Maximum Density)
Structures & Building Slabs	90
Streets, Paved Areas, Bike Paths	90
Sidewalks	85
Grassed Areas	80

4-1.2.2 The requirements shall be verified or modifications recommended by the consulting professional geotechnical engineer in the report wherever engineering, soils, or climatic factors indicate the necessity. Any modification to the stated compaction requirements shall require the approval of the Contracting Officer.

4-1.3 Capillary water barrier. A capillary water barrier is required for all interior slabs on grade, including **(AM#4)**, carports and storage rooms. As a minimum, the capillary water barrier shall be 6 inches.

4-1.4 Soil treatment. Soil treatment for termites shall be by the chemical method. Methods, and extent of protection required, shall comply with local or state industrial standards, whichever is the more stringent.

4-1.5 DELETED

4-1.6 Radon mitigation. The Contractor shall refer to paragraph 14- ENVIRONMENTAL for radon issues.

4-2 Water Distribution System. Connection to the existing water distribution system shall be made at the nearest water main capable of meeting the requirements for service to the facilities.

4-2.1 Water Mains and Building Service Connections. Mains shall be considered as that part of the distribution system supplying fire hydrants, or fire hydrant laterals. Service connections supply water from the main to the building. Separate meters will be provided at each unit. Mains shall be looped with no dead ends and be of adequate size to satisfy both domestic and fire flow requirements. Minimum main size is 0.15 m [6 in]. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. A copper tracer wire shall be placed directly above all non-metallic mains when plastic marking tape does not provide means of determining alignment of pipe by metal detecting equipment. The pipe, valves, and all other materials shall meet the American Water Works Association (AWWA) standards for a 1,034.2 kPa [150 psi] working pressure system. Provide sacrificial anodes for all valves and metal pipe. Building connections shall be designed and constructed in accordance with the National Standard Plumbing Code.

4-2.2 Flow requirements. Water must be supplied by mains of appropriate capacity to provide 37.9 L/s [500 gpm] **at one-story units and 56.8 L/s [750 gpm] at two-story structures, (AM#3)** for a flow duration of 1-1/2 hours. This mandatory flow is over and above domestic requirements. Domestic requirements shall be based on 1135.6 liters/day (300 gal/day) per housing unit for single family housing **and duplexes. AM#3** Mains shall be sized to carry this flow with a 2.5 peak hourly factor. Pressure shall be a minimum of 137.9 kPa [20 psi] at the required flows indicated above for each fire hydrant, and a maximum of 1,034.2 kPa [150 psi] at each outlet after allowing for friction, elevation, and other pressure losses. Pressure at each housing unit shall not exceed 517.1 kPa [75 psi]. Fire flow data is included as ATTACHMENT 9.

4-2.3 Trenches. Water and gas mains may be installed in the same trench, with the gas main placed on a shelf at least 0.3 m [12 in] above and to one side of the water mains. (Coordinate with the local gas utility supplier to determine system acceptability). Water mains shall have a minimum of 0.9 m [3 ft] of earth cover.

Minimum cover above water lines shall be 0.75 m [2 ft 6 in] in grassed areas and 0.9 m [3 ft] in paved areas. Adequate cover must be provided for freeze protection. Where frost penetrates to a depth greater than the minimum above, greater cover will be required. Sufficient cover must also be provided to protect the pipe against structural damage due to superimposed surface loads. Lines laid lower than the minimums stated shall be concrete encased with a minimum concrete thickness of 0.15 m [6 in].

4-2.4 Fire hydrants. Hydrants shall conform to AWWA C502, Dry-Barrel Fire Hydrants. Valves shall conform to AWWA C500, Gate Valves for Water and Sewerage Systems. Fire hydrants shall be compatible with those presently in use at the installation or local Government Jurisdiction, with similar pump and hose connections for one 115 mm (4-1/2") pumper connection and two 65 mm (2-1/2") hose connections. Fire hydrant spacing shall be no greater than 152 m [500 ft] apart, by paved road. In addition, a hydrant shall be provided so that all parts of the housing units can be reached by hose lines not over 107 m [350 ft] long. Hydrant laterals shall be 0.15 m [6 in] minimum size, shall not exceed 15.2 m [50 ft] in length, and shall have an underground shutoff valve. Valve box, at each lateral, shall be located within 3 m [10 ft] of the hydrant, and shall not be located where obstructed by parked vehicles, shrubbery, etc. Guard post barriers shall be provided where hydrant locations are subject to vehicle damage. A minimum 1.5 m (5 ft) clearance shall be maintained between fire hydrants and poles, trees, shrubs or other permanent obstructions. Hydrants shall be located no closer than 1 m (3 ft) and no further than 2 m (7 ft) from the street curb line. Fire flow data, for hydrants in the existing Patch-Chaffee area, is included as ATTACHMENT 9.

4-2.5 Shutoff valve. Each building shall be provided with a separate service and main shutoff valve, readily accessible to maintenance and emergency personnel. Shutoff valves in walks are prohibited.

4-2.6 Valve Boxes. Valve boxes shall be cast iron of approved manufacture. Boxes shall be extension type with slide type adjustment and with flared base. The word "WATER" shall be cast in the cover. The boxes shall be of such length as will be adapted, without full extension, to the depth of cover required over the pipe at the valve location. Valve boxes shall be suitable for traffic. Cast iron valve boxes shall be bonded with the ferrous valve and cathodically protected. Cast iron valve boxes shall have a protective coating applied using a coal tar epoxy.

4-2.7 Materials for Water Lines. Acceptable materials for water lines are as follows:

4-2.7.1 Service Lines less than 80 mm (3") in diameter: galvanized steel, polyvinyl chloride (PVC) plastic, Oriented PVC plastic polyethylene or copper tubing.

4-2.7.2 Service Lines greater than or equal to 80 mm (3") in diameter: ductile iron, PVC, filament-wound or centrifugally cast reinforced thermosetting resin, reinforced plastic mortar pressure pipe or steel.

4-2.7.3 Distribution Lines greater than or equal to 80 mm (3") in diameter: ductile iron, PVC through 900 mm (36") nominal diameter plastic, Oriented PVC plastic filament-wound or centrifugally cast reinforced thermosetting resin, reinforced plastic mortar pressure pipe or reinforced concrete.

4-3 Sanitary Sewerage System. Connection to the existing sewage collection system shall be made at the closest sewer line(s) capable of servicing the housing units. Sewage collection systems shall be designed and constructed in accordance with the National Standard Plumbing Code criteria in this paragraph, and installation requirements. Pipe sizes and slopes shall be calculated using the Manning Formula. Manholes are required at all changes of direction and spaced not more than 152 m [500 ft] apart. A fixed siderail ladder shall be provided for manholes greater than 3.6 m (12 ft) in depth. The word "SEWER" shall be cast in manhole covers. Curved sewers are prohibited. Pipes shall be designed to flow full and maintain a minimum velocity of 0.6 m [2 ft] per second. If siphons are used, two lines of equivalent capacity shall be used with cleanouts. Where pumping is required, force mains shall be sized to minimize pumping head, with a 0.9 m to 1.5 m [3 ft to 5 ft] per second velocity.

4-3.1 Sewer mains. Design shall be based on an average daily per capita flow of sanitary sewage of 378.5 L [100 GAL] per day with a 4.0 peak hourly factor. Mains shall be a minimum of 0.2 m [8 in] in diameter.

4-3.2 Sewer Building Laterals. Each building lateral shall be connected directly to a sewer main. Manholes shall be provided where lateral lines exceed 30 m (100 ft) in length from the housing unit to the service main line.

Combining multiple building laterals is prohibited. Two-way cleanouts shall be provided to allow cleaning of all lines to grade. Cleanouts, in yard areas, shall be set in a box with a hinged cover. Laterals from one building shall not cross under another building. Lines shall be sized in accordance with the National Standard Plumbing Code. Sewer laterals serving a housing unit shall be a minimum of 0.15 m [6 in] in diameter.

4-3.3 Trenches. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum lateral separation of 3.0 m [10 ft].

4-3.4 Cover. Sewer lines shall be located at a depth greater than the frost penetration. Minimum cover above the top of pipes shall be 0.6 m [2 ft] in areas not subject to vehicular loads and 0.9 m [3 ft] in all other areas. If the minimum cover can not be met, the length of pipe shall be concrete encased with a minimum 0.07 m [3 in] thickness of concrete.

4-3.5 Acceptable Materials for Sanitary Sewer Lines. Non-reinforced Concrete (bell and spigot), Plastic (PVC or ABS), reinforced plastic mortar pipe, reinforced thermosetting resin pipe, ductile iron, cast iron soil pipe or clay (extra strength). Cement used for concrete pipe fittings, manholes and other sanitary sewer structures shall be Type V.

4-3.6 Design Criteria. Gravity lines shall be sized based upon peak flow and designed to provide a minimum velocity of 2 feet per second (fps) at the average daily flow rate and a minimum velocity of 2.5 fps to 3.5 fps at 1/2 the peak flow rate. The maximum flow velocity shall not exceed 10 fps, based on peak flow. For gravity lines, Manning's formula shall be used. Manning's "n" values less than 0.013 shall not be permitted despite manufacturer's reports of "n" values between 0.009 and 0.011. When the required 2 fps flow velocity at the average flow rate cannot be met in gravity sewer lines (lateral or main) due to inadequate flow, a minimum slope of 0.6% shall be provided for 150 mm (6") lines and 0.4% for 200 mm (8") lines.

4-4 Storm Drainage System. The storm drainage system shall be properly coordinated with surrounding properties to ensure that runoff does not cause damage to other properties. All drainage lines, if required, shall remain in conduit to stable grade. The minimum pipe size shall be 300 mm (12") inside diameter. The minimum velocity of flow in conduits during a design storm shall be 0.07 m/s [2 ft 6 in/s]. Storm water collection, disposal (and retardation) system shall be designed for a minimum of a 10-year return frequency. Rainfall intensities for project locations shall be in accordance with local community/locality/State Transportation (Highway) agency design parameters.

4-4.1.1 Storm Runoff. The Rational Method as described in **ATTACHMENT 6 (AM#4)** shall be used to calculate storm runoff. Stormwater detention shall be incorporated which minimizes erosion and settling. Detention should be designed to avoid creating an area that is unsightly, difficult to maintain or a menace to health or safety.

4-4.1.2 Storm Drainage Design. Runoff from other properties presently directed towards the new project site shall be incorporated into the new storm drainage system design to ensure that this runoff does not cause damage to surrounding properties and the new housing area. Storm drains shall be designed in accordance with criteria in **ATTACHMENT 6 (AM#4)**. Storm drain systems shall be designed so that the hydraulic grade line for the computed design discharge is as near optimum depth as practicable, and velocities are not less than 2.5 fps when the drains are one-third or more full. Energy dissipators shall be provided at storm drain outlets where outlet velocities exceed 5 fps. Storm drain inlets shall be located so that no collection swales flow across a street or sidewalk to reach a storm drain, other than where cross gutters are used. Side opening catch basins are preferable. Where a grating must be used, it shall be of "bicycle proof" design. Sidewalk culverts are not permitted.

4-4.2 Manholes. Manholes shall be located at intersections and changes in alignment or grade. Intermediate

manhole maximum spacing shall be 76.2 m [250 ft] for pipes 0.9 m [3 ft] or less in diameter or box drains with the smallest dimension less than 0.9 m [3 ft]. Maximum spacing for intermediate manholes on larger pipes and drain boxes shall be 152 m [500 ft]. Manholes shall be precast concrete and shall conform to ASTM C 478 or AASHTO M 199. Steel ladders shall be installed where the depth of the manhole exceeds 0.9 m [3 ft]. The ladder shall be galvanized after fabrication in accordance with ASTM A 123. The wall along the ladder shall be vertical. The manhole shall have a 0.6 m [2 ft] minimum opening as measured from the face of the steel ladder.

4-4.3 Drainage of roads and pavements. Provide a positive crown or sheet drainage to all streets and roads. Pavement collectors for storm water shall be by curb inlets and gutters. Open areas shall be drained by field inlets and an underground collection system. No roadside ditches shall be permitted. Overland flow shall be held to a minimum, where feasible. The maximum flow in all gutters shall be restricted to the quantity which will cause flooding of 1/2 the adjacent traffic lane at the design storm flow. When this flow is reached, it shall be intercepted and removed to an underground system. Inlets in the sag of vertical curves on streets that act as sumps shall be oversized 100%. Design shall be based on the Rational Formula and other criteria contained in ATTACHMENT 8.

4-4.4 Pipe for culverts and storm drains may be of concrete, clay, corrugated steel, corrugated aluminum alloy, PVC, or PE. Cement used in concrete pipe, fittings, manholes and other storm drainage structures shall be Type V.

4-5 Gas Distribution System. Gas lines are owned by City Public Service (CPS). CPS will design and construct the new gas distribution system and service lines, up to and including the meter. A gas regulator and meter to monitor fuel use shall be provided for each housing unit. The meter and regulator will be provided and installed by CPS. All new construction shall be coordinated with CPS. The Contractor is responsible for design and construction of service lines within the units and the laterals connecting to the CPS installed meters. Service laterals shall be designed in accordance with local codes and CPS requirements. Gas lines shall comply with the requirements of ASME B31.8. Shutoff valves shall be provided on the exterior of each building. Contact CPS for determination of all costs associated with connection to the gas distribution system and meters. Existing lines that are to be abandoned shall be either removed or physically disconnected from all gas sources and purged. Abandoning existing gas piping shall be done in accordance with ANSI B31.8, Gas Transmission and Distribution Piping Systems. Installation of gas piping will be in accordance with ANSI B31.8 and 49 CFR 192.

4-5.1 Materials. Materials and appurtenances shall be free of defects and suitable to accomplish the stated objectives of gas distribution systems. Pipe shall be polyethylene or steel as described below.

4-5.1.1 Polyethylene pipe shall conform to ASTM D2513, Standard Specification for Thermoplastic Gas Pressure Piping Systems, with fittings complying with either ASTM D2513 or ASTM D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing. Connections to metal pipe shall comply with ANSI B16.5, Pipe Flanges and Flanged Fittings, or manufacturer's recommended standards.

4-5.1.2 Steel pipe shall conform to ASTM A 53, Grade A or B, Type E or S, Schedule 40; or seamless or electric resistance welded, Schedule 40; black, as specified in ASME B31.8. Furnace butt welded pipe may be used in sizes 40 mm [1-1/2 inch] and smaller. Fittings 40 mm [1-1/2 inch] and smaller shall conform to ASME B16.11. Pipe flanges and flanged fittings larger than 40 mm [1-1/2 inch], including bolts, nuts, and bolt patterns shall be in accordance with ASME B16.5, Class 150. Butt weld fittings shall be in accordance with ASME B16.9. Weld neck flanges shall be used.

4-5.2 Testing. Prove that the entire system of gas mains and service lines is gas-tight by an air test, in accordance with ANSI B31.8. The test shall continue for at least 24 hours between initial and final readings of pressure and temperature.

4-5.3 Drips. Unless high pressure natural gas is used, drips shall be installed at the low points, immediately

following reduction from high pressure to medium pressure (at supply points) and at occasional low points throughout the system to provide for blowing out the lines.

4-5.4 Valves. Plug valves shall be installed at intersections of mains and other locations so that interruptions to service can be confined to no more than 30 housing units.

4-5.5 Mains and service lines. Lines shall not be placed under any buildings. Lines shall be placed with a minimum of 0.6 m [2 ft] of earth cover. Protective casings shall be provided to protect lines from superimposed street or heavy traffic loads.

4-6 DELETED

4-8 Electrical Distribution. Connection to the existing aerial **(AM#2) or underground** medium voltage electrical distribution system shall be made as directed by the Ft. Sam Houston exterior electrical shop. Point of contact is Jaime Machado at 210-221-3350. Existing aerial **(AM#2) or underground** power lines on and around the site can be seen on the attached site drawings. **(AM#2) Aerial connection shall be made utilizing hot line stirrups, surge arrestors, fused cutouts, terminators, rigid galvanized steel conduit riser, and all other necessary hardware for a complete installation. (AM#2) Underground connection shall be as directed by the exterior electrical shop.**

4-8.1 System Design. The electrical on-site distribution system shall be designed in compliance with the rules and recommendations of ANSI C2, National Electrical Safety Code; NFPA 70, National Electrical Code whichever is more stringent; and ANSI C84.1, Electric Power Systems and Equipment – Voltage Ratings. Provide new electrical distribution system as necessary and connect to existing system. Distribution system shall be a load-balanced 3-phase loop-primary radial system incorporating a minimum of two sectionalizers. Sectionalizer feeder loads shall be as balanced as possible. Primary feeder cables shall be copper or aluminum. Medium voltage conductors shall have protective shielding. Use of concentric neutral type cable is not allowed. Medium voltage conductors shall be buried a minimum of 1.2 m [4 ft] below the finished grade with continuous cable marker tape 0.3 m [1 ft] below grade. Cable markers shall be installed along the length of direct-burial cable runs to identify their routes from the surface. Markers will be provided at changes of direction and at intervals not to exceed 152.4 m [500 ft]. Underground direct-burial distribution is required.

4-8.2 Underground splices. Underground connection or splices are prohibited, except in boxes or manholes. Splices shall be in a self-draining, rodent-resistant manhole or box with a cover.

4-8.3 Secondary Feeders. Each transformer shall feed a single secondary underground type distribution pedestal (free standing, pad-mounted enclosure with enclosed molded case breakers); and each pedestal shall feed underground service laterals (to allow disconnection of power to individual houses), street lighting, etc.

4-8.4 Secondary Distribution Pedestals. Pedestals shall have a circuit breaker panel with a main circuit breaker and branch circuit breakers for each housing unit service, street lighting circuit, etc. The pedestal load center shall be rated for the available fault current from the transformer. The load center enclosure shall be both NEMA 3R and NEMA 12. Enclosure shall be capable of being locked. The pedestal line terminals and the circuit breaker panel bus shall, as a minimum, be rated for 125% of the maximum nameplate output of the connected transformer.

4-8.5 Service laterals. Service laterals shall be underground. The length of secondary distribution service laterals from the transformer secondary to the building service entrances shall be minimized. Voltage drop in each service lateral shall not exceed three percent at the calculated maximum demand load. Service laterals shall be sized to supply no less than the largest total demand load as determined by the National Electrical Code, Article 220, Part B or Part C, whichever is greater. However, an additional 88 percent demand factor may be applied to laterals that feed buildings with two or more dwelling units.

4-8.6 Service entrance. Only one service entrance per building shall be provided. The service entrance conductor shall be buried a minimum of 0.9 m [3 ft] below finished grade with a minimum separation of 0.3 m [1

ft] from telephone or TV cables. System shall be designed such that the fault current available at the service entrance equipment will not exceed 10,000 amps.

4-8.7 Transformers. Transformers shall be pad-mounted and have two non-fused switches for the loop connection. The high voltage compartment of the transformer shall include a load break switch with fused circuit for the transformer. The transformer secondary voltages shall be 120/240 V, single-phase, three-wire, solid neutral service to housing units. In selecting a transformer, the nameplate rating shall not be less than 90 percent of the kilovolt/amperes (kV/A) demand load calculated for the transformer. Demand load shall be calculated by the method listed in the National Electrical Code, Article 220, Part B or Part C, whichever is greater.

4-8.8 Street, sidewalk, and area lighting. Residential roadway lighting, including collector streets, shall be provided. Provide lighting at roadway intersections, and at intervals not exceeding 60.9 m [200 ft] between intersections. Roadway poles and fixtures shall match existing poles located at the intersections along the northwest boundary of the site. Lighting shall be provided at intervals not exceeding 60.9 m [200 ft] along sidewalks not otherwise illuminated. Sidewalk poles (approximately 4 m tall) and fixtures shall match existing found in the residential area adjacent to the site. Area lighting shall also be provided for all playgrounds and tot lots. Luminaries shall be actuated by photoelectric control, one photocell per circuit, and supplied from multiple circuits originating from secondary distribution pedestals. All lighting levels shall be provided in accordance with the IES Lighting Handbook. **Wooden poles are not allowed. (AM#4)**

4-8.9 Existing power lines. Existing aerial and underground medium voltage power lines traverse across the site and are identified on the attached site drawings. These lines shall be demolished and new lines shall be provided per Ft. **(AM#2) Sam Houston** exterior electrical shop.

4-9 Metering. Metering of utilities shall be provided as follows:

4-9.1 DELETED

4-9.2 Individual meter and meter drops. Individual utility meter drops (including water) shall be provided for each dwelling unit (duplexes contain two dwelling units). Provide electric watt-hour meters adjacent to the service entrance point. Provide manual by-pass jumper plates for each watt-hour meter socket. Locate utility meter drops in an area readily accessible by service personnel. Meters and meter bases shall be sight screened, and located to provide convenient access while not distracting from building appearance.

4-9.3 Gas metering. Individual housing unit metering devices, which comply with local requirements, shall be furnished and installed by CPS. Separate meters shall be provided at duplexes. Meter and regulator location shall be sight screened, and located to provide convenient access while not distracting from the appearance of the units.

4-9.4 Water meter requirements. Water meters are required at each unit. Separate meters shall be provided at duplexes. Each water meter shall be sized to provide 1.26 liters per second @ 34.5 kPa loss (20 gpm @ 5 psi loss) and shall be the nutating disc type, bronze case, bronze disc, straight reading register (gallons).

4-10 Telephone. The **(AM#2) local** telephone company **(AM#2)** _____ will furnish and install distribution cables **(AM#2) and all other materials needed to provide telephone service to each dwelling unit up to the protected telephone terminal ("Demarcation Box") located on the side of each dwelling unit. Contractor is responsible for contacting the local telephone company during design and implementing the local telephone company's cable distribution design into the electrical site plan. Contractor shall provide the local telephone company the site design to enable the local telephone company to produce a telephone cable distribution design. During construction, contractor shall coordinate with local telephone company and allow local telephone company on the site to install their cabling and other necessary materials to provide telephone service to each dwelling unit. Local telephone company is Southwestern Bell. Primary POC for Southwestern Bell is Ms. Linda Zugina at 210-483-3966. Secondary POC is Mr. Simon Martinez at 210-483-3959.**

4-10.1 **(AM#2) All existing aerial/underground telephone cables (AM#2) that** traverse through the site **(AM#2) will be located and identified by FT. Sam Houston to enable contractor to relocate affected cables as part of the design. It is the contractor's responsibility to ensure this is done. Ft. Sam Houston POC for this is Mr. Carlos Santillan at 210-221-1418. The attached electrical site drawings identify some, but most likely not all existing cables. (AM#2)**

After cables have

been identified, contractor's cable relocation design shall be coordinated with the Ft. Sam Houston Information Technology Business Center (ITBC). POC is Mr. Rick Coleman at 210-221-5955. Outage allowance shall be per Ft. Sam Houston ITBC.

4-10.2 **(AM#2) Deleted.**

4-11 Television. A cable TV distribution system shall be provided for each dwelling unit. There is an existing cable TV distribution system located in the vicinity of the east and west sides of the site. Local cable TV Company shall provide contractor with a connection point(s) to these existing systems. Contractor shall provide all trenching and backfilling in accordance with local cable TV Company requirements. All other materials required for a complete and operable system other than those listed in section 9 will be furnished and installed by the local cable TV company. Close coordination between the contractor and the local cable TV Company shall be maintained throughout the entire design-build process. Local cable TV Company is Time Warner. POC for Time Warner is Peter Perez at 210-352-4466. E-mail address for Mr. Perez is Peter.Perez@twcable.com.

4-12 Cathodic Protection. Cathodic Protection (CP) is mandatory on buried ferrous metallic structures as described below:

4-12.1 Department of Transportation guidance as stated in 49 CFR, Part 192, requires that all metallic natural gas piping be coated and cathodically protected regardless of the soil resistivity.

4-12.2 CP systems must be designed to provide protective potential to meet the requirements of the National Association of Corrosion Engineers (NACE) Standard RP-0169, Control of External Corrosion on Underground or Submerged Metallic Piping Systems, or NACE Standard RP-0185, Control of External Corrosion on Metallic Buried, as appropriate.

4-12.3 New CP systems shall be compatible with other adjacent structures or components.

4-12.4 When plastic pipe is used to extend a steel gas distribution main, an insulated No. 8 AWG copper wire shall be exothermically welded to the existing steel main and run the length of the new plastic main. This wire can be used as a locator tracer wire and to maintain continuity to any future steel gas main extension.

4-12.5 CP and protective coatings shall be provided for the following buried and submerged ferrous metallic structures regardless of soil or water resistivity:

4-12.6.1 Natural gas and propane piping.

4-12.6.2 DELETED

4-12.6.3 DELETED

4-12.6.4 Fire protection piping.

4-12.6.5 Ductile or cast iron pressurized piping under floor (slab on grade) in soil.

4-12.6.6 Underground heat distribution and chilled water piping in ferrous metallic conduit.

4-12.6.7 DELETED

4-12.7 Cast iron pipe shall be treated as follows:

4-12.7.1 For soil resistivity below 10,000 Ohm-cm at pipeline installation depth, provide CP, bonded joints, and protective coatings.

4-12.7.2 For soil resistivity between 10,000 and 30,000 Ohm-cm at pipeline installation depth, provide bonded joints only.

4-12.8 Copper water service lines will be dielectrically isolated from ferrous pipe. Dielectric isolation shall conform with NACE RP-0286.

4-12.9 For ductile iron piping systems (except for ductile iron piping under floor in soil) conduct an analysis to determine if CP and/or bonded or unbonded coatings are required. Unbonded coatings are defined in ANSI/AWWA C105/A21.5.

4-12.10 Conduct an economic analysis to determine if CP and protective coatings should be provided for gravity sewer lines and the following structures in soil resistivity conditions above 10,000 Ohm-cm:

4-12.10.1 Potable water lines.

4-12.10.2 Concentric neutral cable.

4-12.10.3 Other buried and submerged ferrous metallic structures not covered above.

4-12.11 Ferrous metallic piping passing through concrete shall not be in contact with the concrete.

5. UNIT DESIGN - ARCHITECTURE.

5-1 Unit Design. The architectural work includes the design and construction of 70 housing units. 20 SrNCO units and 50 JrNCO units are to be constructed. The SrNCO dwelling units are to be single story or two story, three bedroom detached houses. The JrNCO units are to be single story or two story, four bedroom detached houses or duplexes.

5-2 These dwellings shall convey a visual image consistent with Fort Sam Houston's design characteristic and it's physical organization. The dwellings are to be part of the New Post, zone 2a. The dwellings are to be compatible with the Noncommissioned Officers Quarters' massing, proportion and scale and material and color, window and doors, and details. The New Post, zone 2a definitions are established in the Fort Sam Houston Design Guide (FSH DG). Also covered in the FSH DG are exterior guidelines and interior guidelines.

5-3 Designs shall provide unit net areas which do not fall below the minimum values shown in the table below.

TABLE 5-1

Pay Grade	Number Of Bedrooms	Minimum Net Floor Areas	
		m ²	ft ²
O-1/3 (CGO) W-1/4 E-7/9 (SNCO)	3	125	1,350
E-1/6 (JNCO)	4	125	1,350

5-3.1 Net area definition. Net area is defined as the space inside the exterior and party walls. Net area excludes:

5-3.1.1 Exterior and party walls.

5-3.1.2 Half thickness of interior walls adjacent to excluded areas.

5-3.1.3 Utility and laundry rooms.

5-3.1.4 Interior and exterior bulk storage.

5-3.1.5 Washer and dryer closet.

5-3.1.6 Furnace, domestic water heater, and solar equipment spaces.

5-3.1.7 Stairwells.

5-3.1.8 Landings.

5-3.1.9 Walls and interior spaces specifically designed for passive solar systems (other than required habitable areas).

5-3.1.10 Weather vestibules (not to exceed 1.5 m² [16 ft²]) sheltering the main entry.

5-3.1.11 Unfinished attic and basement space.

5-3.1.12 Patios or balconies and terraces.

5-3.1.13 Carports and garages.

5-3.1.14 Increases required to meet accessibility standards.

5-3.1.15 Open or screened porches without heating, air conditioning, or interior-type finishes. In localities subject to adverse weather conditions, such as wind-driven mist or noxious atmosphere, or both, open porches may be enclosed with appropriate fenestration or screening, or both, and not considered to increase the net area of the housing units, provided that air conditioning or heating, or both, is not added and the basic character of the enclosed area is still that of a porch.

5-3.2 Allowable net area increases. The minimum net floor area is noted in table 5-1. Proposals to increase the net area of the SrNCO dwellings will be considered a betterment. SrNCO dwellings may increase by 15% of the area shown in table 5-1, while lowering the total number of SrNCO dwellings by 10%. 18 SrNCO dwellings may be constructed if each contains **143.75 square meters (1552.5 net square feet) (AM#4)**. The net area increase does NOT apply to the JrNCO dwellings.

5-3.2.1 5% of the dwelling units are to be ADA accessible. Physical limitations may include any of several types of disabilities. The unit should anticipate a variety of conditions. Accessible housing units shall be designed in such a way that they may be easily and readily modified to accommodate physically challenged occupants, if necessary, at time of occupancy. This means required access clearances, room sizes, bathroom layout, kitchen layout, doors and hardware, grab bars, plumbing hookups, light switches and outlets, controls, and warning devices must meet requirements at time of construction. Readily modifiable means that requirements for adjustable height cabinets and work surfaces, plumbing fixtures, and the warning devices for the hearing and visually impaired can be made either at time of construction or at time of occupancy.

5-3.2.2 Deleted

5-3.2.3 Deleted

5-4 Functionality. Rooms shall be sized and arranged for efficient use, good circulation, and furniture placement. The distribution of space for food preparation living and dining, sleeping, bathing, halls, closets, and services should be balanced and should enhance the intended functions. The master bedroom shall be isolated from the other bedrooms. The submitted floor plan shall pursue an open plan between the kitchen, living and dining room.

5-4.1 Habitable rooms shall not be used as halls for entry into a housing unit or for primary circulation within a housing unit.

5-4.2 Provide convenient access between carport and service area, and between kitchen and service area.

5-4.3 Do not use a sliding glass door as a primary housing unit access.

5-5 Indoor and Outdoor Integration. Emphasize factors that enhance indoor and outdoor living. Consider size, layout and location of patios, balconies and yards, and features that encourage family use of outdoor areas.

5-6 Fire Protection and Safety. Housing units will comply with the applicable National Fire Codes, including NFPA 101, Life Safety Code, and the Mil Hdbk 1008C, Fire Protection for Facilities. Construction features will be provided in accordance with the International Building Code (IBC).

5-6.1 Fire resistance of walls and roof material. Walls separating living units from exterior bulk storage shall be of U.L. design for 1-hour fire rating partitions and shall extend from ground to the underside of the roof sheathing, as a single design assembly. Penetrations in the fire rated partitions shall maintain the rated integrity. This requirement shall be in addition to any code requirements. Provide class A (ASTM E 108, Standard Methods of fire tests of roof covering) roof covering material throughout. party walls and roof material.

Party walls shall extend without openings, from ground to the underside of roof sheathing. Provide firestops at floor, and ceiling or roof line. Provide Class A (ASTM E108, Standard Methods of Fire Tests of Roof Coverings) roof covering material throughout. Party walls (walls separating housing units) shall have the minimum fire-resistance ratings shown below:

5-6.1.1 Duplexes, one hour.

5-6.1.2 Deleted.

5-6.1.3 Deleted.

5-6.2 Party floors. Party floors shall have a topping slab of 50 mm [1-1/2 inch] lightweight concrete, or similar material. Party floors shall have a minimum one-hour fire-resistance rating, in accordance with ASTM E119.

5-6.3 Equipment rooms. Rooms equipped with fuel-fired equipment such as boiler rooms, furnace rooms, and rooms with fuel-fired water heaters, which serve more than one housing unit shall be separated by one-hour fire-rated construction. Direct access to these rooms from the exterior is preferred. Rooms with fuel-fired equipment that serve only one housing unit shall be lined with 13 mm [1/2-inch] gypsum board or equivalent noncombustible material.

5-6.4 Alarm systems. Smoke detectors which are located within the housing unit and which sound an alarm only within the housing unit are not required to be transmitted to the installation fire department.

5-6.5 Deleted.

5-7 Sound Attenuation.

5-7.1 Testing. Certified proof-of-performance field tests will be conducted to demonstrate that the floor and wall systems as constructed provide the required sound isolation. Tests for air-borne sound shall be made in compliance with ASTM E336. Tests for impact sound shall be made in compliance with ASTM E1007. Testing of 10 percent (minimum) of each type of floor and wall system is required. Location of test sites will be chosen at random by the Contracting Officer.

5-7.1.1 Any wall or floor system found to be inadequate shall have the deficiencies corrected and the additional qualifying tests conducted at the Contractor's expense. Testing at the Contractor's expense of greater than 10 percent of each system may be required if the Contracting Officer determines that the quality of construction requires this additional testing.

5-7.1.2 Walls and floor ceiling systems shall be designed to meet or exceed the requirements stated below. In cases where the field tested performance of the systems does not meet the designed performance, the maximum acceptable difference between field tests and sound transmission ratings shall be 2 decibels (dB) for airborne sound ratings and 5 dB for impact sound ratings.

5-7.2 Party walls and floor and ceiling construction between housing units (party floors) shall be designed to provide the minimum airborne sound transmission ratings and impact isolation ratings stated in Table 5-2.

**TABLE 5-2 - SOUND TRANSMISSION STANDARDS
FOR PARTY WALLS AND FLOOR/CEILING CONSTRUCTION**

Area	FSTC ¹	FIIC ²
Party Walls (Unit Separation)	52	
Primary Habitable Areas (Living, Dining, Family Room, Bedrooms, Circulation)	52	
Habitable Wet Areas (Kitchen, Bath, Utility, Laundry, Equipment)	52	-

Note¹: Field Sound Transmission Class. See ASTM E336.

Note²: Field Impact Isolation Class. See ASTM E1007.

5-7.3 Floor construction. Floor construction between occupancies shall be designed to provide the minimum FSTC and FIIC ratings stated in Table 5-2. Materials used to obtain the required sound attenuation for the floor construction shall not be liquid-soluble or softened by moisture. Sound insulation shall have a flame-spread rating of 25 or less and a smoke development rating of 50 or less when tested in accordance with ASTM E84.

5-7.4 Plumbing and HVAC equipment. Design of plumbing and Heating, Ventilating, Air-Conditioning (HVAC), and dehumidifying equipment shall include design provisions such as location, enclosure and acoustical treatment, to minimize transmission of noise generated by equipment within each housing unit and to eliminate transmission of noise to other housing units.

5-8 Dimensions and Areas. Minimum areas and dimensions for interior spaces are shown in Table 5-3. Minimum areas and dimensions for exterior spaces are shown in Table 5-4.

TABLE 5-3 - MINIMUM AREAS AND DIMENSIONS - INTERIOR SPACES

Space	Area		Length		Width/Depth		Height ¹
	m ²	ft ²	mm	ft-in	mm	ft-in	
Living ²	14.0	150	3550	11-8	3550	11-8	2300
Dining (/3 BR) ²	8.4	90	2900	9-6	2900	9-6	2300
Dining (4/ BR) ²	10.2	110	3200	10-6	3200	10-6	2300
Family Room ²	8.4	90	2900	9-6	2900	9-6	2300
Kitchen ^{3,6}	6.0	64	2450	8-0	2450	8-0	2300
Eating in Kit. ⁴	6.7	72	2600	8-6	2600	8-6	2300
Refrigerator & Freezer	0.5	6	900	3-0	600	2-0	1800
Washer/Dryer ⁵	1.7	18	1800	6-0	900	3-0	2300
BR #1	14.0	150	3550	11-8	3550	11-8	2300
BR #2	11.1	120	3000	10-0	3000	10-0	2300
BR #3	9.0	100	3000	10-0	3000	10-0	2300

TABLE 5-3 - MINIMUM AREAS AND DIMENSIONS - INTERIOR SPACES

Space	Area		Length		Width/Depth		Height ¹
	m ²	ft ²	mm	ft-in	mm	ft-in	mm
BR #4/5	8.4	90	2900	9-6	2900	9-6	2300
Full Bath ⁶	-	-	-	-	1500	5-0	2300
Equipment room ⁸	- <u>(AM#4)</u>	- <u>(AM#4)</u>	-	-	-	-	2300
Vestibule	1.2	13	1000	3-3	1200	4-0	2300
Hall & Stairway ⁷	-	-	-	-	1000	3-3	2300

Note¹: Ceiling heights in habitable rooms shall be a minimum of 2300 mm [7 ft-6 inches].

Ceiling heights can be reduced in parts of these rooms to 2100 mm [7 ft] to accommodate ducts.

Note²: Room dimensions are exclusive of circulation. Circulation paths along one side of a room are permitted but add 1000 mm [3 ft-3 inches] to the minimum dimension.

Note³: A minimum of 1200 mm [4 ft] must be maintained in front of and between cabinets.

Note⁴: Minimum area and dimensions are measured from face of cabinets to walls.

Note⁵: Minimum area and dimensions are indicated for a washer and dryer closet. This area may also be provided in a utility room. When so provided, area and dimensions are exclusive of circulation.

Note⁶: Accessible units must conform to UFAS. UFAS requires greater minimum dimensions.

Note⁷: Clear width is measured between railings.

Note⁸: The length and width/depth shall accommodate the equipment installed and any required area to access and maintain the equipment.

TABLE 5-4 - MINIMUM AREAS AND DIMENSIONS - EXTERIOR SPACES

Spaces	Area		Length		Width/Depth		Height ¹
	m ²	ft ²	mm	ft-in	mm	ft-in	mm
<u>Carport (AM#2)</u>	21.6	240	3650	12-0	6100	20-0	2300
Balconies	6.7	72	1800	6-0	1800	6-0	2300
Patio - 3 BR	13.6	144	-	-	3000	10-0	2400
Patio - 4 BR	17.0	180	-	-	3000	10-0	2400

Note¹: Ceiling heights apply when patios and balconies are covered.

5-8.1 Minimum area requirements for kitchen cabinets, counters, and pantries are shown in Table 5-5. Flat area is shown for countertops and drawers. Combined shelf area is shown for pantry and base, wall and wall cabinets.

TABLE 5-5 - KITCHEN CABINET, COUNTER, & PANTRY AREA

Type of Housing Unit	Wall		Base		Drawer		Counter		Pantry	
	m ²	ft ²	m ²	ft ²	m ²	ft ²	m ²	ft ²	m ²	ft ²
Others 4 BR	2.8	30	3.8	40	1.7	18	1.5	16	1.5	16
Others 3 BR	2.3	24	3.0	32	1.3	14	1.1	12	-	-

5-8.2 Minimum closet width requirements are stated in Table 5-6. **(AM#4)**.

TABLE 5-6 – MINIMUM CLOSET WIDTHS¹ (AM#4)

Type of Unit	EM	
	Mm	Ft
Coat/ Entry Hall	900	3
Master ² BR #1	1800	6
BR #2	1200	4
BR #3	1200	4
BR #4	1200	4
Broom	900	3

Type of Unit	EM	
	Mm	Ft
Linen ³	600	2

Note¹: Minimum inside clear depth for standard/broom closets shall be 600 mm [2 ft].

Note²: Walk-in closet is preferred.

Note³: Minimum clear inside depth for linen closets shall be 430 mm [1 ft-6 inches].
(AM#4)

5-8.3 Minimum requirements for interior, exterior, and combined bulk storage are shown in Table 5-7.

TABLE 5-7 – MINIMUM INTERIOR, EXTERIOR, & COMBINED BULK STORAGE¹ (AM#4)

Type of Unit	Type of Storage	EM	
		m ²	ft ²
3 BR	Int.	3.0	32
	Ext.	3.7	40
	Comb.	7.9	85
4 BR	Int.	3.7	40
	Ext.	4.5	48
	Comb.	9.3	100

Example¹: If interior bulk storage is 2.3 m², then exterior bulk storage must be 4.2 m² to obtain the combined bulk storage requirement of 6.5m². (AM#4)

5-9 Major Zones. Living and Dining, Kitchen, Family Room, and Bedrooms.

5-9.1 Living and dining. The living room should have direct access to the front entrance foyer and to the dining area without passing through another room. When circulation is required along the perimeter of the space or between areas in open plans, minimum circulation space of 1000 mm [3 ft-3 inches] shall be added to the required minimum room dimension.

5-9.1.1 The dining area may be an extension of, or an "L" off the living room.

5-9.1.2 The dining area shall be directly accessible from the kitchen without passing through another room.

5-9.1.3 For Senior Officer family units, provide separate dining rooms or areas to accommodate furniture and seating for not less than 10 persons.

5-9.2 Kitchen and auxiliary dining area.

5-9.2.1 The kitchen shall provide an efficient work triangle. A base cabinet, minimum 380 mm [15 inches] wide, shall be provided on the handle side of the refrigerator. The range shall not be located adjacent to the refrigerator, in a corner, or adjacent to a passageway. The dishwasher shall be installed adjacent to the kitchen sink. Provide a backsplash behind the range, extending to the underside of the range hood, finished to match the countertop or range and the range hood. Space for a tenant-owned upright freezer shall be provided adjacent to the kitchen or in areas such as the utility room **(AM#4)**. Space for a tenant-owned microwave oven shall be provided in the kitchen by way of a microwave cabinet.

5-9.2.2 Provide auxiliary dining areas in the form of table space in the kitchen or in a family room adjacent to, or as an extension of, the kitchen. The auxiliary dining area shall not be located in the living or dining rooms.

5-9.2.3 In the kitchen, shoe molding (1/4 round) is required at all base cabinets where they meet the floor surface.

5-9.3 Family room. Provide a separate family room, adjacent to and contiguous with the kitchen, for all three-, four-bedroom units.

5-9.4 Bedrooms. Bedrooms shall be designed to accommodate king-size beds in master bedrooms and twin beds in the other bedrooms. Window, door, and closet placement should enhance furnishability. Each bedroom shall be accessible without passing through another bedroom.

5-10 Minor Zones. Bathrooms, Laundry, Closets, and Bulk Storage.

5-10.1 Bathrooms. Emphasis shall be placed on size, furnishings, layout, and privacy. Direct access to a bathroom from the master bedroom is required for three- and four- bedroom units. Compartmented bath design, for family and guest use, is encouraged. Determine the number of bathrooms based on Table 5-8.

TABLE 5-8 - BATHROOM REQUIREMENTS

Number of Bedrooms per Floor	Number of Bathrooms Per Floor
3 - 5	2

5-10.1.1 A full bath shall contain a water closet, lavatory, and either a tub with shower assembly or a shower stall. One full bath in each housing unit shall include a tub with shower assembly and shall be directly accessible from the bedroom hall without passing through another room. Showers, and tubs with shower assemblies, shall include shower curtain rods with curtain rings. A half bath contains a lavatory and a water closet.

5-10.1.2 Provide lavatories mounted in 610-mm [2-ft] wide (minimum) countertops, with vanity bases. Countertops shall be high pressure laminated plastic, ceramic tile, marble, or homogeneous, non-porous, solid surface type materials, with minimum 100 mm [4 inches] high back splashes. Maximize vanity storage space.

5-10.1.3 Bathroom accessories may be surface mounted or recessed, of non-corrodible metal or ceramic tile, and shall include a toilet paper holder, soap dish (at sink and at tub/shower), toothbrush and tumbler holder, and grab bar at tub or shower stall, bathrobe hook, and towel bars totaling not less than 1100 mm [42 inches] for a full bath and not less than 750 mm [30 inches] for a half bath.

5-10.1.4 A mirror glass above the vanity and a recessed medicine cabinet shall be provided in each bathroom. Cabinets shall be corrosion-resistant with plate glass mirrors, sliding or hinged door type. Do not place recessed medicine cabinets in party walls.

5-10.1.5 Tubs and showers shall not be placed under windows.

5-10.1.6 Exhaust shall be provided in all baths, shall be ducted directly to the exterior of the building, and shall be a part of an engineered ventilation system (See paragraph 10).

5-10.2 Laundry. Washer and dryer space may be provided in an enclosed recess off the hall in two-bedroom units. Three-bedroom and larger units shall have a separate utility room.

5-10.2.1 The space provided shall have doors that provide full access when open. A minimum of two full-length shelves, 250 mm [10 inches] minimum nominal depth, are required above the washer and dryer.

5-10.2.2 Minimum net clear door width to washer and dryer space when open is 1600 mm [5 ft-4 inches] for an enclosed recess and 800 mm [2 ft-8 inches] if located within a utility room. Doors shall be either undercut or louvered to provide adequate make-up air for the dryer in accordance with typical household.

5-10.3 Closets. Closets shall provide the minimum widths indicated in Table 5-6. A broom closet shall be provided convenient to the kitchen, and a coat closet shall be located convenient to the housing unit entrance.

5-10.3.1 Closet shelving. Closets (except linen closets) shall be equipped with a 305 mm [12 inches] deep shelf and a clothes hanger rod. Linen closets shall be provided with at least four full-depth shelves. Closet shelving and rods in excess of 1200 mm [4 ft] shall have center supports. Shelves and supports shall be capable of carrying 52 kg/m [35 lbs/ft]. Closet shelving shall be minimum 19 mm [3/4 inch] thick solid wood, plywood, or high-density particleboard. Factory Finished welded wire shelving shall not be used.

5-10.3.2 Closet doors. Closet doors should be located to permit placement of furniture in the corners of the rooms by providing a 460-mm [18-inch] return adjacent to a furnishable wall. Closets 1800 mm [6 ft] or more in width shall have sliding doors, maximum 2000 mm [6 ft-8 inches] high. Wall closet width shall not extend beyond either doorjamb more than 510 mm [20 inches]. Wardrobe closet doors (sliding and bi-fold) shall be provided with both top and bottom door tracks. Accordion doors are not permitted.

5-10.4 Bulk storage. Provide each housing unit with interior and exterior bulk storage space meeting the minimum requirements of Table 5-7. Provide interior storage in a separate room or included as an extension of the utility room when one is provided. Provide exterior storage in (AM#4) a separate exterior enclosure, or within the housing unit with access from the exterior. Exterior storage space shall be lockable.

5-10.4.1 Utility room. The utility room may contain a utility sink. The utility room should be located adjacent to the rear entrance. If a utility sink is not submitted a hose bib will be located near the rear entrance at a hardstand.

5-10.4.2 Bulk storage space should be at least 1200 mm [4 ft] in depth and a minimum clear height of 2000 mm [6 ft-6 inches], except that space under stairs may be counted at 1/2 area if the space is 1200 mm [4 ft] or more in height.

5-10.4.3 Provide a minimum of three nominally 305 mm [12 inches] deep shelves with a combined length of 7300 mm [24 ft] within each bulk storage room.

5-10.4.4 Common walls and ceilings between adjacent storage areas shall be finished on both sides.

5-10.4.5 The equipment room shall contain heating and cooling systems equipment. The equipment room shall be accessible from the exterior. Consideration should be given to design accessibility to the equipment room by maintenance personnel even after the resident fences in the yard at a later date. There shall be a lighted dry covered flat surface for maintenance personnel to work. The HVAC filters are to be accessible from within the dwelling.

5-11 Interior Finishes

5-11.1 Provide three interior color/finish schemes.

5-11.2 Walls and ceilings. Provide a minimum of 13 mm [1/2-inch] gypsum wallboard, taped and smooth or orange peel finished. Water-resistant wallboard shall be used in wet areas such as bath, powder, and laundry rooms. Cementitious backer board shall be used for ceramic tile applications. An orange peel ceiling finish may be provided in areas other than kitchen, laundry, or bathrooms. Interior finish shall have a flame-spread rating of 25 or less and a smoke-developed rating of 50 or less when tested in accordance with ASTM E84. Clear acrylic corner guards may be used to protect corners. Wallpaper shall not be used.

5-11.3 Kitchen and eating area walls and ceiling. Combined kitchen and eating rooms shall have the same type of wall and ceiling finishes.

5-11.4 Flooring and stairs, base, and carpet. Kitchen, laundry, and utility flooring shall be sheet, seamless vinyl with wood base. Bedrooms may contain sheet vinyl with wood base but prefer wood flooring. The hall, and living-dining area flooring shall be sheet vinyl with wood base or vinyl composition tile with wood base. Wood flooring or a factory-made, prefinished wood plank floor with wood base in the living-dining area will be considered a betterment. Bathrooms shall be of ceramic tile flooring with ceramic tile base or seamless sheet vinyl with wood base. Interior stairs shall be hardwood with clear finish, or softwood with carpet. Additional consideration will be given to designs which incorporate ceramic tile bathroom floors and hardwood stairs with a clear finish. This material identification is not justification to exceed the mandatory price limitation set forth in this solicitation.

5-11.4.1 Vinyl composition floor tile shall conform to ASTM F1066, Standard Specification for Vinyl Composition Floor Tile, and have a minimum thickness of 2.381 mm [3/32-inch].

5-11.4.2 Sheet vinyl shall conform to ASTM F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing, Type II, Grade 2. Flooring shall be installed as a monolithic material with seams welded or bonded for a seamless installation. No seams shall be permitted in spaces less than 12 feet in width.

5-11.4.3 Ceramic tile shall conform to ANSI 137.1, moderate or heavy grade.

5-11.4.4 Carpet shall be installed in the stretch method over carpet pad utilizing tackless strips in accordance with CRI-104. Carpet shall meet the following criteria:

5-11.4.4.1 Properties: Tufted construction, 100 percent branded continuous filament nylon or polyethylene terephthalate, soil hiding, multi-colored, loop or cut pile, 1/8 gauge, yarn weight 800 grams per square meter [28 ounces per square yard], total weight grams per square meter [60 ounces per square yard], 5000 minimum density, synthetic primary and secondary backing.

5-11.4.4.2 Tuft bind for tufted carpet shall meet a minimum of 44 N (10 pounds) when tested in accordance with ASTM D1335, 1967; R-1972

5-11.4.4.3 Carpet shall meet requirements of 16 CFR 1630 and have a minimum average critical flux of .45 watts per square centimeter when tested in accordance with ASTM E648.

5-11.4.4.4 Deleted

5-11.4.4.5 Ten-year warranty from the carpet manufacturer against edge ravel, delamination, and tuft bind.

5-11.4.4.6 Carpet pad shall be 1/2 inch bonded urethane, minimum 6-pound density. Urethane pad will conform to ASTM.D.3676.

5-11.4.4.7 Carpet edging shall be 38 mm [1-1/2-inch] minimum width floor flange and minimum 15.5 mm [5/8-inch] wide face.

5-11.4.4.8 Tackless strip for stretch-in installation over carpet pad shall be exterior grade Douglas Fir

plywood, with minimum dimensions of 29 mm by 7 mm [1-1/8-inch wide] suitable for the cushion thickness specified. Tackless strips with two or three rows of staggered pins shall be used. For areas over 6100 mm [20 ft] long, tackless strip with three rows of pins shall be used. Pins of the proper length shall be provided to penetrate through carpet backing, but shall not be a safety hazard.

5-11.4.4.9 Carpet containing recovered material is designated in 40 CFR 247.12 as an affirmative procurement item. Products containing recovered material will be provided when price, performance, and availability meet project requirements. Various nylon and polyethylene terephthalate carpet offer the opportunity to meet this requirement.

5-11.5 Painting. Primers, paints, and stains shall meet or exceed the requirements of [Unified Facilities](#) Guide Specification 09900, Paints and Coatings, provided in the Technical Specifications. The paint selected shall be scrub able. Finishes shall be lead free. (AM#5) Walls and ceilings in kitchen, baths, laundry, utility rooms, and all painted trim shall be painted with semi-gloss enamel. Colors shall be submitted by the Contractor and approved by the Contracting Officer. Blown-on acoustical finish is prohibited. Orange peel finish on gypsum walls and ceilings may be used.

5-12 Carport If trash or bulk storage areas are included in the carport, such areas are in addition to the required car storage area. Refer to Table 5-4 for minimum dimensions. Set the carport slab elevation a minimum of 100 mm [4 inches] below the level of the housing unit floor and the floor of the adjoining exterior storage. Slope slabs to drain away from the housing unit.

5-13 Roofing and Drainage. Slopes for the roofs are to maintain the 1:2 pitch (AM#3) established at Patch-Chaffee.

5-13.1 Roof water. Gutters and downspouts shall be provided for all roof areas. The gutter system should minimize maintenance. The Design should prevent water run-off onto porous materials. Downspouts draining onto a lower roof shall have metal or plastic splash deflectors. Concrete splash blocks shall be provided under downspouts if not connected to the storm drainage system.

5-13.2 Roof surface. Emphasis shall be placed on low maintenance and durability of roof material. The number of roof penetrations shall be minimized. Wood shake or shingle roofs are prohibited. The following roof materials may be used, but are listed in declining order of preference.:

5-13.2.1 Deleted

5-13.2.2 Minimum of 245 kg [540 lb], standing or flat seam, metal roofing, _____ (AM#2) factory finish. The metal roof assembly shall conform to UL580 class 90.

5-13.2.3 Clay, concrete tile.

5-13.2.3.1 Clay roofing tile shall be machine formed natural clay tiles, one piece "S" Mission, kiln-fired to vitrification and free from surface imperfections. Provide specially shaped, color-matched units as indicated or required for ridges, rakes and hips. Provide with cast-in anchor lugs, transverse weather checks and fastening holes.

5-13.2.3.2 Concrete roof tiles shall be extruded, interlocking concrete roofing tile units, shape as indicated, with integral color. Include specially shaped, color-matched units as indicated or required for ridges, rakes and hips. Provide with cast-in anchor lugs, transverse weather checks and fastening holes.

5-13.2.3.3 Underlayment shall be ASTM D 2178, Type VI.

5-13.2.4 Deleted

5-13.2.5 Deleted

5-13.3 Deleted.

5-14 Exterior Finishes. Emphasis shall be placed on low maintenance and durability for exterior finish materials. Materials shall be residential in size, scale, and texture. Exterior finish materials for exterior bulk storage buildings and carports (AM#4) will match the primary dwelling unit. The following siding materials may be used, but are listed in declining order of preference:

5-14.1 Stucco. Portland cement plaster or synthetic stucco shall have integral color. Stucco total surface area shall be divided into panels with control joints spaced no more than 300 mm [10 ft] apart to form a panel of less than 14 m² [150 ft²]. Contractor shall follow manufacturer's installation instructions explicitly and shall certify accurate and correct installation of all stucco type materials.

5-14.2 Deleted

5-14.3 Deleted

5-14.4 Exterior Insulation Finish System (EIFS). EIFS may be used if high quality materials and installation checks are used. A drainage EIFS system shall be used. Provide a complete secondary weather barrier with a water-shedding drainage plane and flashings. Provide sealed isolation joints around all penetrations. Provide pan flashing at windows. Use wet-mix base coats. Use 6-ounce or heavier mesh. Use high-impact mesh at the ground level and in traffic areas. Use silicone sealants for joints. Contractor shall follow manufacturer's installation instructions explicitly and shall certify accurate and correct installation of all EIFS type materials.

5-14.5 Deleted

5-14.5.1 Deleted.

5-14.5.2 Deleted

5-14.5.3 Deleted.

5-14.5.4 Hardboard and cement asbestos shingle siding are not acceptable.

5-14.6 Trim elements. Aluminum or vinyl clad wood trim is preferred over painted or stained wood trim. Painted exterior surfaces shall be minimized. When exterior exposed wood trim is used, the following requirements apply:

5-14.6.1 Wood fascia and rakes are required and shall be 25 mm [1 inch] nominal boards with solid blocking or 50 mm [2-inch] nominal boards without blocking. Plywood, hardboard, or gypsum board are not permitted for fascias or rakes.

5-14.6.2 Exposed wood, such as window trim, door sills, window sills, railings and balusters, wood fencing, solar shading devices including louvers, arbors, and trellis shall be treated for rot resistance in accordance with NWWDA Industry Standards I.S.4, Water Repellant Preservative Treatment for Millwork.

5-14.6.3 Exterior surfaces requiring painting shall receive a minimum of one prime coat and two finish coats of paint. Wood trim frames, etc., shall be back primed. Exterior semi-transparent stains, two coats, are acceptable, where appropriate for wood, plywood, etc.

5-14.6.4 Mounting brackets shall be installed to accommodate a ¾" to 1" flag pole. The mounting bracket will be installed on the front side of the house at a convenient location for use.

5-14.7 Exterior ceilings and soffits. Exposure of roof framing and underside of roof/floor decks are not permitted. Exterior ceilings and soffits will be trimmed or otherwise architecturally treated and coordinated with

siding. Exterior ceilings and/or soffits may be prefinished metal, vinyl, plywood, or 9.5 mm [3/8-inch] 303 medium density overlay siding material, EXT-APA conforming to American Plywood Association Standard B840, 303 Siding Manufacturing Specifications. Cement asbestos ceiling or soffit are not permitted.

5-14.7.1 Mounting brackets for small satellite dishes. Metal mounting brackets are to be fastened to the roof framing structure at the soffit. The residents will furnish their own satellite dishes. One mounting bracket for each single family and two mounting brackets for each duplex shall be installed. The duplexes shall have the brackets located as not to require one neighbor to enter the other neighbors yard to access their respective bracket/dish. The dishes shall have an unobstructed path so as to achieve clear signals. The brackets are to be located on the rear elevation or one of the side elevations; whichever gives a clear unobstructed signal. The brackets are not to be located on the front elevation of any of the units. (AM#2)

5-14.8 Patios. Patios shall be sloped to drain and have a broom-finished concrete floor surface.

5-14.9 Balconies and porches and stoops shall be sloped to drain away from the unit and have a concrete floor surface which provides a waterproof and non-slip surface. Plastic coating or films over concrete decks are not acceptable. Exposed wood decks, stained or painted, are not acceptable. Balcony topping shall have a minimum thickness of 38 mm [1 1/2-inch] with welded-wire mesh reinforcement. Exposed wood rails and trim shall be treated to deter damage from moisture decay and insect infestation or be iron bar stock, painted with rust inhibiting black paint.

5-14.10 Exterior Stairs. Exterior stair treads and landings shall be constructed of concrete or steel, and provided with non-slip type treads. Exposed wood rails and trim shall be treated to deter damage from moisture decay and insect infestation or be iron bar stock, painted with rust inhibiting black paint.

5-15 Glazed Openings. Windows and glazed door (50 percent or more glass) units shall meet the following standards and must be certified by an independent testing laboratory. Windows that slide (double-hung, single-hung, and horizontal sliding) and glass exterior doors shall meet the standards for hung units. Standards for casement windows shall apply to all hinged or fixed windows. Other window types may be used if they have been tested and conform to the standards for hung windows. The Contractor shall provide the manufacturer's certification that the window provided meets the following test requirements:

5-15.1 Required tests. Hung units will meet a National Fenestration Rating Council (NFRC) design pressure rating of 25. Casement windows will meet NFRC design pressure rating of 40. Evidence of passing the following specific tests and minimum standards are required to achieve these design pressure standards.

5-15.1.1 Structural testing. Using ASTM E330 test results shall demonstrate no glass breakage, damage to hardware, or permanent deformation that would cause any malfunction or impair the operation of the unit. Residual deflection of any member shall not exceed 0.4 percent of its span. Hung windows shall be tested at pressures of 1796 Pa [37.5 lb/ft²], and casement windows shall be tested at pressures of 2873 Pa [60.0 lb/ft²].

5-15.1.2 Operating force. The force necessary to unlatch and open units shall not exceed 13.6 k [30 lb] for hung units and 15.9 k [35 lb] for casements.

5-15.1.3 Air infiltration. Using ASTM E283 leakage rate shall not exceed 0.65 l/min/m² [0.25 ft³/min/ft²] for hung units and 0.39 l/min/m² [0.15 ft³/min/ft²] for casements, at a test pressure of 7.66 k/m² [1.57 lb/ft²].

5-15.1.4 Water penetration. Using ASTM E547, no leakage shall be evident when tested in three, five-minute cycles with a one-minute rest period between cycles at 18.3 k/m² [3.75 lb/ft²] for hung units and 29.3 k/m² [6.0 lb/ft²] for casements.

5-15.1.5 U-Value. Whole window U-values shall comply with Table 7-1. U-values shall be calculated using ASTM E1423 and NFRC 100-91.

5-15.2 Glazed doors. Glazed doors shall have insulated steel, vinyl clad wood, or thermally broken aluminum frames conforming to the above requirements. Finish shall be factory applied and conform to 44-C-22431 in accordance with the requirements of the National Association of Architectural Metal Manufacturers (NAAMM) Metal Finishes Manual. Operable panels shall be equipped with screens. Sliding panel screens shall have extruded aluminum tubular frames mitered at corners, channel-shaped corner angle reinforcement, and nylon bottom rollers. Doors shall have interior operated latch, and securing pin or throw-bolt in frame. Screening shall be nonferrous.

5-15.3 Glazing. Units shall be double glazed with low E-glass. The design shall consider the work involved in repair and replacement of individual panes and overall window groups.

5-15.4 Interior window stools shall be solid-wood, paint-grades with a minimum thickness of 19-mm [3/4-inch].

5-16 Screens. Screens shall be provided at all operable sashes. Screens and frames shall be aluminum, of window manufacturer's standard design, and conform to AAMA 1002.10, Voluntary Specification for Aluminum Insulating Storm Products for Windows and Sliding Doors.

5-17 Window Treatments. Provide 25 mm [1 inch] metal blinds at windows and glazed hung doors. Color shall be manufacturer's standard off white, and shall be coordinated with wall color. Drapes shall not be provided. Shades are not permitted.

5-18 Doors. See Table 7-1 for thermal performance requirements for exterior doors.

5-18.1 Entrance doors. The housing unit primary entrance door shall be 900 mm [3 ft] in width by 2050 mm [6 ft-8 inches] in height by 45 mm [1-3/4 inch] thick, thermal metal. Other housing unit entrance doors should meet this requirement but may be of lesser width. Equipment room entrance door shall be 900 mm [3 ft] in width by 2050 mm [6 ft-8 inches] in height by 45 mm [1-3/4 inch] thick, metal. **Exterior door frames shall be painted hollow metal, reinforced to accept door hardware. (AM#5)**

5-18.2 Bulk storage door. Exterior bulk storage door shall be a minimum 35 mm [1-3/8 inch] thick, exterior grade, thermal metal, or hollow core metal. **(AM#4)**.

5-18.3 Aluminum screen and storm doors. Screen and self-storing storm doors shall be provided for all housing unit exterior hinged doors. Frames shall be a minimum of 32-mm [1-1/4-inch] thick and 51 mm [2 inches] wide. Aluminum alloy materials shall be not less than 1.27-mm [0.05-inch] thick and 51 mm [2 inches] wide. Doors shall have solid bottom panels and midsection protective grills. Screening materials shall be aluminum.

5-18.4 Interior doors. Interior doors shall be 2050 mm [6 ft -8 inches] in height by 35 mm [1-3/8 inch] thick, hollow core wood or hollow panel. Wood doors will be painted. Door frames shall be paint grade solid wood construction. Pre-hung and pre-finished doors and frames may be used.

5-19 Builders Hardware. Hinges, locks, and latches will comply with the specifications indicated in Table 5-10, and the following subparagraphs:

TABLE 5-10 – HARDWARE SPECIFICATIONS

Hardware Type/ Specification	Specific Requirements
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TABLE 5-10 – HARDWARE SPECIFICATIONS

Hardware Type/ Specification	Specific Requirements
Hinges ANSI/BHMA A156.1	Hinges shall be 102 mm x 102 mm [4 in x 4 in] at exterior doors, and 90 mm x 90 mm [3-1/2 in x 3-1/2 in] at interior doors. Ball bearings shall be of a base material of brass or bronze except as noted for fire rated door.
Locks & Latches ANSI/BHMA A156.2	<u>(AM#5) Series 4000, Grade 1, at exterior doors. Grade 2 at interior doors. Provide trim of wrought brass, aluminum, or stainless steel.</u>
Auxiliary Locks ANSI/BHMA A156.5	Series 4000, Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Interconnected Lock & Latches ANSI/BHMA A156.12	Grade 2. Provide matching trim of wrought brass, aluminum, or stainless steel.
Closers ANSI/BHMA A156.4	Series CO2000, Grade 2.

5-19.1 Locks and keys. Lock cylinders shall have six pin tumblers and interchangeable cores that are removable by a control key. Provide a master keying system. Locks for each housing unit, including exterior storage and garage door(s), shall be keyed alike. The Contractor shall provide one extra set of cores for each 50 housing units and furnish four keys for each key change and for master key system and control key. Locks and keys shall conform to the standards and requirements of the Builders Hardware Manufacturers Association ANSI/BHMA A156.2 listed above.

5-19.2 Weatherstripping and exterior thresholds. Provide nonferrous metal or vinyl weatherstripping for all housing unit exterior doors. Vinyl magnetic weatherstripping is acceptable for metal doors. Exterior thresholds shall be nonferrous metal.

5-19.3 Applications. Locks and hinges shall be applied as follows:

5-19.3.1 Exterior hinged doors shall have 1-1/2 pair of hinges, lockset, and an auxiliary lock or interconnected lock and latch,

5-19.3.2 Each windowless entrance door will have a viewer mounted at eye level.

5-19.3.3 Exterior bulk storage door shall have 1-1/2 pair of hinges and lockset.

5-19.3.4 Interior doors shall have one pair of hinges and latchset with ANSI/BHMA A156.2, F75 or F76 operations.

5-19.3.5 Doors in fire-rated walls shall have 1-1/2 pair of steel ball-bearing hinges, lockset, auxiliary lock or interconnected lock and latch and closer. (AM#5)

5-19.3.6 Hardware Trim. Lock trim shall be cast, forged or heavy wrought construction of commercial plain design. In addition to meeting the test requirements of BHMA/ANSI A156.2 or 156.13, lever roses

and escutcheons shall be a minimum of 1.27mm (.05 inches) thick. If reinforced, the outer shell shall be a minimum of 0.89mm (.035 inches) thick and the combined thickness shall be a minimum of 1.78mm (.07 inches) except the knob/lever shanks which shall be a minimum of 1.52mm (.06 inches) thick. (AM#5)

5-20 Postal Service and Building Signage.

5-20.1 Postal Service. All new units shall be provided with an individual mailbox.

5-20.2 Building Signage. All new units shall be provided with building identification signage in accordance with the Installation Design Guide requirements.

5-20.3 Housing numbers. Provide a five-digit number for each dwelling unit. Provide a minimum 100 mm (4 inch) high house identification numbers/ letters in a Helvetica medium font colored black on a reflective white background mounted on 12-gauge aluminum for each dwelling unit. The house identification shall be mounted near each entry. The Contracting Officer will assign housing numbers.

5-20.4 Occupant Identification Signage. Provide occupant identification signage similar to existing family housing signage. Signage shall be interchangeable and made of plastic with routed letters. Total sign height shall be 50 mm (2 inch) overall including the frame. Signs shall be mounted 1500 mm (5 feet) above finish grade at side of entry. All signage should conform to the guidelines established by TRADOC sign standards (TRADOC Reg. 420-14). Names and rank shall be as directed by the Contracting Officer.

5-21 Kitchen Cabinets. Cabinets may be pre-fabricated and pre-finished or factory manufactured of wood. Wall cabinets shall have adjustable shelves. Cabinets shall have magnetic catches except where spring-loaded self-closing hinges are provided. Cabinets shall include knobs/handles and or pulls and shall conform to ANSI A161.1, Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets, except where modified below. Wall and base cabinets shall be essentially of the same construction and appearance. Refer to Table 5-5 for minimum kitchen cabinet area requirements. Additional cabinet space may be achieved with tall wall cabinets.

5-21.1 Cabinets construction. Construct cabinets with frame fronts and solid ends, or of frame construction throughout. Frame members shall be mortised and tenoned, dovetailed or doweled, and glued together. Brace the top and bottom corners with hardwood blocks that are glued with water-resistant glue and nailed in place. Wood cabinet materials and dimensions - Materials and minimum dimensions and thicknesses for cabinet construction materials shall comply with Table 5-11.

TABLE 5-11 – KITCHEN CABINET SPECIFICATIONS

Element Description	Specific Requirements
Frame Members	19 mm x 38 mm [3/4 in x 1-1/2 in] kiln-dried hardwood.
Base Cabinet Toe Space	64 mm deep x 102 mm high [2-1/2 in x 4 in].
Cabinet Bottoms, Backs & Tops (Unexposed)	5 mm [3/16 in] hardwood plywood. Provide bottoms in kitchen sink cabinets. Brace bottoms with wood members glued in place.

TABLE 5-11 – KITCHEN CABINET SPECIFICATIONS

Element Description	Specific Requirements
Cabinet Ends & (Exposed Backs/Bottoms)	Hardwood plywood, 5 ply, good grade for natural finish. Base Cabinets: 13 mm [1/2 in] Wall Cabinets: 10 mm [3/8 in]
Doors	16 mm [5/8 in] hardwood plywood, good grade for natural finish, with hardwood trim. Raised panel or recessed panel.
Drawer Slides/Glides	20 gauge metal. Grade 2 ANSI/BHMA A156.7
Drawer Fronts	16 mm [5/8 in] solid hardwood, matching doors.
Drawer Bottoms	3 mm [1/8 in] softwood plywood, Grade A-B veneer. Bottoms 380 mm [15 in] wide shall be braced and glued in place.
Interior Partitions	13 mm [1/2 in] hardwood or softwood plywood, Grade A-A or comparable veneer.
Shelves	13 mm [1/2 in], softwood plywood (Grade A-B Veneer), hardwood plywood (good grade veneer), or glued-up solid wood. Support shelves on ends and on 610 mm [24 in] centers. Shelf edges exposed to view shall be rounded, filled, sanded, and finished.

5-21.2 Countertops. Countertops finish may be high pressure laminated plastic 1.1-mm [0.043-inch] thick for post-formed tops or 1.3-mm [0.05-inch] thick for countertops with separate backsplash, and shall be applied with heat-resistive adhesive. Countertops may also be ceramic tile or homogeneous, non-porous, solid surface materials. Minimum backsplash height is 100 mm [4 inches]. The substrate for countertops (except solid surface countertops) shall be 19 mm [3/4-inch] thick exterior plywood. The area behind the oven-rang and range hood shall be protected by a back splash.

5-22 Appliances. Provide the following equipment in accordance with specifications listed, one each per housing unit. A listing of currently labeled Energy Star appliances is available through the Internet at the EPA website: <http://www.energystar.gov/products/appliances.html>.

5-22.1 Refrigerators. Comply with UL 250, Household Refrigerators and Freezers and shall bear the EPA "Energy Star" certified label. Provide refrigerator with frostproof top freezer, automatic defrosting, and icemaker. Refrigerator shall have two vegetable bottom baskets, at least four adjustable shelves, at least two shelves and egg container in door; freezer compartment shall contain separate interior shelves, multiple door shelves, and ice maker. Provide reversible (left swing and right swing interchangeable) doors. Refrigerators shall conform to the energy compliance standards of 10 CFR 430, including those refrigerators manufactured before the code took effect. The use of refrigerants with an Ozone Depletion Potential (ODP) of .05 or less is required. Minimum refrigerator volume and maximum energy use are as follows:

5-22.1.1 Volume: 0.58 CM, 21 CF

5-22.1.2 Energy Efficiency: 722 kWh/yr.

5-22.2 Ranges and ovens. Ranges shall be 760 mm [30 inches] wide and provided with porcelain enamel cooktop, oven, clock and timer, oven light, and cooking surface light. Oven shall have black glass window door, broiler pan, and self-lock racks.

5-22.2.1 Gas ranges shall have two, 150 mm [6-inch] and two, 205 mm [8-inch] burners, a self-cleaning oven, and AGA-approved electronic ignition. Gas ranges shall be in accordance with AGA Z21.1, American National Standard for Household Cooking Gas Appliances.

5-22.2.2 Electric ranges shall have four tubular plug-in surface elements of 4,500 watts minimum, removable reflector bowls, infinite-control switches, and range-indicating lights. Ovens shall be equipped with one, 2,000-watt (minimum) tubular broil element and one, 700-watt (minimum) bake element, oven indicating light, thermostatic heat control, utensil drawer, and self-cleaning oven. Electric ranges shall conform to UL 858, Household Electric Ranges.

5-22.3 Deleted

5-22.4 Range hoods. Provide metal range hoods, the same length as the range, with a stainless steel finish, with separately switched light and exhaust fan. The hood shall have a washable filter. The fan shall have a capacity of not less than 78.7 L/s per meter of range hood [50 cubic ft per minute per linear foot of range hood]. The sound level shall not exceed 6 sones. Duct the fan to the exterior and provide backdraft protection. Range hood shall also have fire extinguishing system for range that will also shut off power or fuel to range in case of extinguishment. Acceptable device is Guardian Model as manufactured by Twenty First Century or equal.

5-22.5 Garbage disposals. Garbage disposals shall conform to UL 430; Waste Disposers; continuous feed, minimum 1/2 HP motor, stainless steel grinding elements, two 360-degree stainless steel swivel impellers, manual motor reset, and sound insulation. A plug connector is required. Garbage disposal shall be InSinkErator model 555ss, Waste King Gourmet Series model SS3100, or approved equal.

5-22.6 Dishwashers. Dishwashers shall conform to UL 749, Household Electric Dishwashers, and be UL listed, electric type, with air gap, racks, lift-out utensil holder, spraying arms, and detergent dispenser. Unit shall be listed as "Energy Star" compliant and shall bear the "Energy Star" label. The automatic controls shall cycle through the Wash, Rinse, Dry / Heat, and Stop phases, and shall be capable of rinse and hold cycle as well as a no heat drying feature. The unit shall contain instantaneous, or in-line, water heater booster, with automatic thermostat set for 60 degrees C [140 degrees F]. Rated energy use for standard capacity models will not exceed 620 kWh/yr. The dishwasher shall have factory applied sound isolating and insulating features for a sound rating no greater than 5 sones

5-22.7 Water heater. See paragraph 8- UNIT DESIGN- PLUMBING.

5-22.8 Ceiling Fans. Ceiling fans are an optional feature. Supports required for future installation are to be included. **See Chapter 9 Electrical, paragraph 9-7.2.3 for additional requirements. (AM#5)**

5-22.9 Color. Kitchen appliances, except disposals and range vent hood, shall be of matching finish, stainless steel/white/almond in color.

5-23 Maintainability. The design of housing units including the selection and specifying of exterior and interior finishes, equipment, appliances, and systems shall include consideration of maintenance ease and cost. Avoid products that require continuing maintenance at high cost. Avoid products with finishes that cannot sustain frequent and harsh scrubbing.

5-24 Fireplace and Chimney. Fireplaces and chimneys are not to be used.

Ft Sam Houston D-B Harris Heights Family Housing, PN 37152

FSHHF

TI 801-02, Army Family Housing, 01 Oct 01

ACCOMPANYING AMENDMENT NO. 0005 TO SOLICITATION NO. DACA63-02-R-0013

6. UNIT DESIGN - STRUCTURAL.

Structural design shall comply with International Building Code and Council of American Building Officials (CABO) One and Two Family Dwelling Code, except as modified herein.

See following sheets for additional Design Criteria and 'ATTACHMENT – 6 (AM#4) SWD ARCHITECTURAL AND ENGINEERING INSTRUCTIONS MANUAL' (AEIM) for Structural Plates.

6.1 Description.

6.1.1 General. The structural criteria established herein shall be used for structural loading, design and installation of all structural systems and foundations, including manufacturing, erection, supervision, testing, and quality assurance of the completed installation of the housing units. All structural calculations shall be checked and initialed as such by a registered structural engineer other than the original design engineer. Refer to ATTACHMENT 7, Geotechnical Report for Foundation Design Analysis requirements and recommendations. The structural work generally consists of design, using the DESIGN LOADS and DESIGN CRITERIA below, but not limited to:

- (1) Foundations.
- (2) Retaining Walls.
- (3) Load Bearing and Non-Load Bearing Walls
- (4) Vertical Framing Members.
- (5) Horizontal Framing Members, including roof decks and diaphragms, roof beams and joists.
- (6) Interconnection Details including all nailing and fastening requirements.
- (7) Special Conditions, such as expansion, construction, and control joints, and changes in floor levels.
- (8) Attachment provisions for architectural, mechanical, and electrical elements.
- (9) Site fencing structure and foundations.

6.2 References. Design methods and stress allowances or load factors for the various structural materials shall be in accordance with the current editions of the codes and specifications listed below. Recommendations made in the codes, specifications and industry standards in this paragraph are requirements of this RFP, unless specified otherwise in this RFP.

(1) American Concrete Institute (ACI 318M) Building Code Requirements for Reinforced Concrete - latest edition.

(2) American Concrete Institute (ACI 302), Guide for Concrete Floors and Slab Construction.

(3) International Building Code - latest edition.

(4) American Plywood Association, "APA Design/Construction Guide" "SDI Diaphragm Design Manual latest Edition."

(5) American Institute of Steel Construction (AISC), Manual of Steel Construction, latest edition.

(6) American Iron and Steel Institute (AISI), Cold Formed Steel Design Manual - latest Edition.

(7) American Welding Society (AWS), Structural Welding Code.

(8) National Forest Products Association, "National Design Specification for Stress Grade Lumber and its Fastening."

(9) American Plywood Association, "APA Design/Construction Guide."

(10) Truss Plate Institute, "Design Specification for Metal Plate Connected Wood Trusses."

(11) Council of American Building Officials (CABO) One and Two Family Dwelling Code – latest edition.

6.3 Selection of Structural System.

6.3.1 The overall structural system shall be selected based on durability, maintainability, and cost-effectiveness. The lateral support system shall consist of a horizontal roof diaphragm and shear walls. The horizontal roof diaphragm shall be developed with "Roof Sheathing". The shear walls shall be developed with "Structural Sheathing", "Let-in Bracing" or "Steel Strap Bracing", or a combination of Structural Sheathing and Let-in Bracing, or a combination of Structural Sheathing and Steel Strap Bracing.

6.3.2 **Foundation System.** The foundation system shall be as required by ATTACHMENT 7, Geotechnical Report.

6.4 Design Loads.

6.4.1 **Dead Loads.** The structural system shall be designed and constructed to safely support all dead loads, permanent or temporary, including but not limited to self weight, partitions, insulation, ceiling, floor covering, and all equipment that is fixed in position. Use ASCE 7-98 for weights of common building materials, or other recognized sources if not in ASCE 7-98.

6.4.2 Vertical Live Loads.

6.4.2.1 As a minimum, design loads shall be as stated in ASCE 7-98 (Minimum design loads for buildings and other structures) code. Design wind uplift loads shall be calculated in accordance with chapter 6 using the basic wind speed of 40 m/s (90 mph) as shown in figure 6-1, using a 3 second gust speed at 10 m (33 ft) above ground for exposure "C" category and associated with an annual probability of 0.02. A plan view of the roof shall be furnished showing all high wind edge zone dimensions and field of roof wind loads. Purlins shall be furnished a maximum of 760 mm (30 in) on center for eave, corner, rake, ridge, hip, and other edge zones and a maximum of 1520 mm (60 in) on center for the remainder of the roof (field of roof). Other criteria is as follows:

Minimum Roof Live Load - 98 K/sq.m (20 psf)

6.4.2.2 Floors shall be designed to support live loads in accordance with the ASCE 7-98 Code except:

Floor Live Load - 195 K/sq.m (40 psf)

Note: Loads may be reduced as permitted by the ASCE code.

6.4.3 **Horizontal Loads** (Acting Inward and Outward). The structural system wind design, including components and cladding shall be designed in accordance the ASCE 7-98 code, and the seismic design shall be designed in accordance with the **TM 5-809-10** - latest edition. An importance factor of 1.0, an exposure category is "C", the required wind speed and **Seismic Zone I** are to be used.

6.5 Design Criteria.

6.5.1 **Foundation Design.** The foundation analysis and design, and minimum dimensions and reinforcement shall be in accordance with ATTACHMENT 7, Geotechnical Report.

6.5.2 **Roof Slope.** All housing units shall have pitched roofs.

6.5.3 Serviceability.

6.5.3.1 Foundation Settlement Strength. An adequate level of protection against structural failure due to uniform and/or differential foundation settlement or general shear shall be provided.

6.5.3.2 Vertical Deflection of Suspended Horizontal Framing Members. Building serviceability shall not be impaired by vertical deflections. The sum of the instantaneous vertical deflections due to live load plus long-term sustained load deflections shall not exceed the span divided by:

(1) 240 at roofs.

(2) 600 at masonry lintels for masonry walls.

6.5.3.3 Horizontal Deflection. Horizontal deflection shall not exceed the limits set forth in the International Building Code - latest edition when the structure is subjected to the required seismic or wind loads.

6.5.3.4 Ultimate Strength of Structural Elements. An adequate level of protection against structural failure under extreme loads shall be provided. The proposer shall check the usual loading conditions for normal factors of safety and the extreme loading conditions, if present, for appropriate (unusual) factors of safety to provide levels of protection appropriate for the conditions.

6.5.4 Durability - Time Reliability.

6.5.4.1 Structural components shall be protected from condensed moisture that could impair their structural adequacy through deterioration.

6.5.4.2 Special attention shall be given to protection for corrosion or oxidation of metals, decay of wood and wood base materials, spalling of concrete, leaching of mortar, and deterioration of adhesives. Prevention of these hazards shall be especially important. Nonstructural steel (handrails, etc.) embedded in concrete shall be galvanized or painted wrought iron. All damaged galvanized areas shall be repaired prior to embedment.

6.5.4.3 The materials used in structural elements, components, and assemblies shall be resistant to or protected from damage by exposure to normal climatic conditions.

6.6 General Design Criteria.

6.6.1 The design drawings shall contain General Notes which shall contain a list of the design loading criteria, a list of the strengths of the engineering materials used, the design soil values, a nailing schedule, and any other data that would be pertinent to remodeling and/or future additions.

6.6.2 Walls mostly below grade that are supported laterally by diaphragms at or near the top and bottom, shall be designed using loadings based on at-rest soil pressures.

6.6.3 Free standing earth retaining walls shall be loaded with active soil pressure and surcharge loading if present, and with this loading the vertical resultant shall be in the middle 1/3 of the footing base width. For this design, factors of safety for overturning and sliding shall be at least 1.5. Retaining walls shall be constructed of reinforced concrete only. Weep holes shall be provided in the wall to eliminate saturated soil conditions behind the wall.

6.6.4 Free standing exterior garden walls shall be designed to resist lateral wind and seismic forces, for the minimum requirements set forth in this document, as per the International Building Code - latest edition.

6.6.5 Diaphragms shall have continuous chord members on all edges and shall have direct positive connection for transferring load to all members of the main lateral force resisting system.

6.6.6 Sheetrock wall covering shall not be used as a lateral resisting element of the lateral design.

6.6.7 The minimum design wind pressure on interior partitions shall be 24 KN/sqm (5psf) normal to the partition. All interior partitions shall be laterally braced.

6.6.8 Radon Mitigation: The Contractor shall design radon mitigation in accordance with **Paragraph 14, Environmental**. A 150mm minimum capillary barrier is required to encapsulate the 100mm perforated pipes of the sub-slab suction system. A polyethylene vapor barrier with a minimum thickness of 0.15mm (6 mils) will be required below the floor slab and above the capillary water barrier.

6.7 Concrete Design.

6.7.1 **General.** All concrete on this project shall have a minimum compressive strength of 21 mpa (3000 psi) at 28 days unless noted otherwise. All foundation walls and footings shall be constructed of reinforced cast-in-place concrete.

6.7.2 **Testing.** Testing of concrete work shall be done at the proposer's expense by an approved independent testing laboratory.

6.7.3 **Forms.** Materials for forms shall be plywood, metal, metal-framed, aluminum, reinforced fiberglass, or plywood-faced, to provide continuous, straight, smooth, exposed surfaces.

6.7.4 **Reinforcing Materials.** Reinforcing Bars: ASTM A 615 M-96a, minimum Grade 300, deformed.

6.7.5 Concrete Materials.

- (1) Cement: ASTM C 150, Type I-II Portland cement low alkali (0.6% or less).
- (2) Fine Aggregate: ASTM C 33.
- (3) Coarse Aggregate: ASTM C 33.
- (4) Air-Entraining Admixture: ASTM C 260.
- (5) Flowing Concrete Admixture: ASTM C 1017, Type 1 or 2.
- (6) Calcium Chloride will not be permitted.
- (7) Fly Ash: ASTM C 618, Class "F"; fly ash content shall not exceed 20% of cement content or 45 kg (100 Lbs) of fly ash per .76 cu m. (Per cubic yard) of concrete, whichever is less.

6.7.6 _____ **(AM#4)**

6.7.7 **Ready-Mix Concrete.** ASTM C 94.

6.7.8 **Slabs and Foundation Systems.** Refer to Attachment 7, Geotechnical Report for Foundation Design Analysis requirements and recommendations.

6.7.9 Additional criteria is as follows:

- (1) Water/Cement ratio shall be less than or equal to 0.42
- (2) Slump at placement shall not be greater than the design mix slump. If contractor elects to pump mix, pumping aids will be allowed, provided shrinkage potential does not increase.
- (3) 7-day wet mat moist curing will be required.
- (4) Reduction of cement content shall be done by using fly ash. The volume of fly ash when combined with portland cement shall be 20% plus/minus 5% of the volume of portland cement plus fly ash.

(5) High range water reducers (HRWR) will be allowed if it is shown that concrete produce with HRWR is not subject to increased shrinkage, segregation, and retarding/flash setting. Testing will be performed on concrete with the proposed HRWR to determine shrinkage potential.

(6) A mix design shall be required that incorporates a 24 mm to 38 mm (1.0 to 1.5 inches) coarse aggregate maximum with appropriate gradation specification. Follow ACI guidance for use of well graded aggregates.

(7) Use ACI 223 guidelines for the use of shrinking-compensating cements.

6.7.10 Conduits and Pipes. Horizontal runs of conduits and pipes will not be embedded in foundation ribs and slabs supported by ground. Vertical penetrations will conform to ACI 318-89. Aluminum conduit and pipes will not be embedded in any concrete structure.

6.7.11 Slab Joints. Slabs will be placed in lane fashion. Area of sections bounded by crack control joints will not exceed 54 sq. m (600 square feet), and distance between crack control joints will not exceed 7500 mm.

6.7.11.1 Slab crack control joints may be construction joints, expansion joints, or weakened plane joints consisting of plastic insert "T" strips (minimum depth shall be 1/4 depth of slab thickness) placed in the fresh concrete. Saw cut joints will not be allowed. Reinforcement will be continuous through crack control joints. Bars shall be located "t/4" below the slab surface, with a minimum of 38mm, and starting 50 mm from edge of slab. The ends of crack control and corners of isolation joints will meet at a common point so far as practical. Stop reinforcing at expansion joints and provide smooth slip dowels (minimum 13 mm diameter) across the joint. Dowels shall be ASTM A 36 material.

6.7.11.2 When thickened slabs are employed under column bases or partitions, crack control joints parallel to the thickened slabs shall be offset from the thickened areas.

6.7.11.3 Walls, when used or required for lateral resistance to wind or seismic, shall be founded on a full foundation.

6.7.11.4 Reentrant corners in slabs will be reinforced with a minimum of one No. 13x900 mm bar (metric) at 45 degrees to the corner.

6.8 Masonry Design.

6.8.1 CMU walls and partitions shall be designed in accordance with TM 5-809-3/AFM 88-3, Chapter 3 (New EI 01S903) – Structural Design For Buildings. Specify and design for type "S" mortar [$F_m' = 9300\text{kPa}$ (1350 psi)].

6.8.2 All masonry exterior, bearing, and shear walls (structural walls) shall be reinforced.

6.8.3 See AEIM paragraph 13, "Walls and Partitions" for additional requirements for CMU design and construction.

6.9 Structural Steel Design.

6.9.1 Detailing of structural steel framing, if any, including connections, shall be complete. All weld types, weld sizes, bolt layouts, bolt sizes, connection plates, members sizes and locations, and stiffener plates sizes and locations shall be shown.

6.9.2 All members, elements and connections that are a part of the main vertical and/or lateral force resisting system must be completely detailed.

6.9.3 Steel columns shall not be embedded over all or part of their height in CMU or concrete walls.

6.10 Cold Formed Steel Structural Framing Design.

6.10.1 Cold formed steel structural framing design shall comply with the American Iron and Steel Institute (AISI), Cold Formed Steel Design manual, Latest Edition, except as herein noted.

6.10.2 The detailing of cold formed steel structural framing, including connections, shall be complete. All welded connections, metal connectors, bolt layouts, bolt sizes, screw fastener patterns, and screw sizes shall be shown in details, notes and calculations. All members that are a part of the main vertical and/or lateral force resisting system must be completely detailed.

6.10.3 Walls, when used or required for lateral resistance to wind or seismic, shall be considered bearing walls.

6.10.4 **Structural Vertical Wall Framing.** Structural vertical load bearing, or non-load bearing wall framing shall be no less than 90 mm (3-5/8") wide, C-shaped metal studs minimum 18-gage thickness at 400 mm on center with minimum 14-gage thickness continuous runner tracks top and bottom of the walls. Vertical studs which are attached to diagonal steel tension strap bracing shall be a minimum 16-gage thickness and have three horizontal rows of equally spaced blocking (blocking shall be the same size member as the vertical studs) between the studs for the horizontal distance of the brace. Wall framing shall be attached to the foundation with minimum 9.5 mm diameter anchor bolts spaced no more than 1200 mm on center. Provide a minimum 50 mm x 50 mm x 3 mm (2"x2"x1/8") washer at each anchor bolt welded to the top surface of the wall bottom runner track. All vertical studs shall be attached by welding or self-tapping screws to the wall top and bottom runner tracks. Welding shall be for the full width of both flanges of the vertical studs or there shall be at least one #12 self-tapping screw through the runner track flange to each flange of the vertical studs.

6.10.5 **Roof Trusses.** Roof trusses shall be designed for the loads indicated. The truss diagonal members shall be no less than 90 mm (3-5/8") wide, C-shaped, minimum 18-gage thickness with minimum 90 mm (3-5/8") wide, 14-gage thickness metal runner track top and bottom chords or a combination of wood combined with a metal unit which is made to adapt with the wood for the top chord outrigger for overhangs. The design of trusses shall be integrated into the vertical and lateral load carrying systems. Truss member connections shall be sized for axial loads and any eccentricity of the members. All diagonal members shall be welded to the truss top and bottom chords for the full width of both flanges of the diagonal members (self-tapping screw connection will not be allowed).

6.10.6 **Sheathing.** No particle board other than grade 2-M-W or fiberboard is to be used in structural applications, including roof sheathing and structural sheathing. The sheathing used shall have adequate and appropriate span rating" per the American Plywood Association (APA) (Design Specifications and Construction Guide) for the application and conditions proposed.

6.10.6.1 **Roof Sheathing.** Roof sheathing shall be APA STRUCTURAL I or II RATED SHEATHING, Exposure 1 or better, 15 mm (19/32-inch) minimum thickness. Joints shall be tongue and grooved or be square edges provide with H clips. All roof sheathing laid shall be covered with felt when a storm is approaching. Roof sheathing damaged due to moisture shall be replaced.

6.10.6.2 **Structural Wall Sheathing.** APA STRUCTURAL II RATED SHEATHING, Exposure 1 or better, 12 mm (15/32-inch) minimum thickness, square edges. Solid blocking (the same size as the wall studs) shall be required at all edges.

6.10.6.3 **Structural Interior Concealed Sheathing.** APA B-D interior, grade 2 or better, 12 mm (15/32-inch) minimum thickness, square edges. Solid blocking (the same size as the wall studs) shall be required at all edges.

6.10.7 **Steel Strap Tension Bracing.** Straps shall be a minimum 14-gage thickness by a minimum 50 mm

wide. Straps shall be welded to each intersecting vertical wall stud and to the wall top and bottom runner track for the full width of the stud and runner track flange.

6.11 Structural Wood Design.

6.11.1 Wood design shall comply with the Uniform Building Code - latest edition except herein noted.

6.11.2 The detailing of structural wood framing, including connections, shall be complete. All metal connectors, bolt layouts, bolt size, nailing patterns and nail size shall be shown in details, notes and calculations. Staples shall not be used for the connections of structural components. All members that are a part of the main vertical and/or lateral force resisting system must be completely detailed.

6.11.3 Exterior wood structural members that are exposed to view such as columns and beams (minimum 100 mm nominal thickness) shall be of lumber that is graded for appearance and decay treated.

6.11.4 Walls, when used or required for lateral resistance to wind or seismic, shall be considered bearing walls.

6.11.5 **Moisture Content.** 19 percent maximum.

6.11.6 **Vertical Wall Framing** (less than 150 mm wide). Studs for walls shall be stud grade lumber. Vertical (load bearing and non-load bearing) wall framing shall be no less than 2X4's at 400 mm on center with single sole and double top plates. Wood may be any species listed in the Uniform Building Code - latest edition which meets the following values:

- (1) Fb (extreme fiber stress in bending):
 - Single Member use: 3.6 Mpa (525 psi) minimum
 - Repetitive member use: 4.1 Mpa (600 psi) minimum
- (2) E (Modulus of elasticity) 6200 Mpa (900,000 psi) minimum

6.11.7 **Structural Framing** (Other than vertical wall framing less than 150 mm wide). Stress Grade lumber. Wood may be any species listed in the Uniform Building Code - latest edition which meets the following values:

- (1) Fb (extreme fiber stress in bending):
 - Single Member use: 6.9 Mpa (1,000 psi) minimum
 - Repetitive member use: 7.9 Mpa (1,150 psi) minimum
- (2) E (Modulus of elasticity): 7,580 Mpa (1,100,000 psi) minimum

6.11.8 **Boards** (less than 50 mm nominal thickness). No. 2 or better per WWPA rules.

6.11.9 **Roof Trusses.** Wood trusses shall be designed for the loads indicated and in accordance with the Truss Plate Institute, "Design Specification for Metal Plate Connected Wood Trusses". The design of trusses shall be integrated into the vertical and lateral load carrying systems. Truss connection plates shall be sized for axial loads of members, eccentricity, and net metal section. A minimum plate size of 9675 sq. mm (15 sq. In) shall be required at any respective connection. The top chord of gable end trusses shall not be notched for the installation of outriggers for a roof overhang of the end of the gable. The outriggers shall be installed on top of the gable end truss top chord.

6.11.10 **Sheathing.** No particle board other than Grade 2-M-W or fiberboard is to be used in structural applications, including roof sheathing and structural sheathing. The sheathing used shall have adequate and appropriate span ratings per the American Plywood Association (APA) (Design Specifications and Construction Guide) for the application and conditions proposed.

6.11.10.1 **Roof Sheathing.** Roof sheathing shall be APA STRUCTURAL I or II RATED SHEATHING or

Particle board Grade 2-M-W, Exposure 1 or better, 15 mm (19/32-inch) minimum thickness. Joints shall be tongue and grooved or be square edges provided with H clips. All roof sheathing laid shall be covered with felt when a storm is approaching. Roof sheathing damaged due to moisture shall be replaced.

6.11.10.2 Structural Sheathing. APA STRUCTURAL II RATED SHEATHING

or Particle board Grade 2-M-W, Exposure 1 or better, 12 mm (15/32-inch) minimum thickness, square edges. Solid blocking (the same size as the vertical studs) shall be required under all edges.

6.11.10.3 Structural Interior Concealed Sheathing. APA B-D interior, Grade 2 or Particle board Grade 2-M-W or better, 12 mm (15/32-inch) minimum thickness, square edges. Solid blocking (the same size as the vertical studs) shall be required under all edges.

6.11.11 Let-in Tension Bracing. Minimum 25 mm nominal thickness by 10 mm actual width "Boards" or "Simpson CWB or TWB" steel strap tension bracing or an approved equivalent (flat steel straps are not acceptable).

6.11.12 Laminated Veneer Lumber. Joints and beams fabricated from laminated veneer lumber may be used. Products must have National Research Board approval.

6.12 Construction Tolerances.

Allowable variations from level, or specified slopes, shall be as follows:

- (1) For overall length, or surface of 3000 mm (10 ft) or less: plus or minus 3-mm (1/8-inch).
- (2) Up to 6100 mm (20 ft): plus or minus 6 mm (1/4-inch)
- (3) Up to 12 000 mm (40 ft): plus or minus 9 mm (3/8-inch).

7. UNIT DESIGN - THERMAL PERFORMANCE.

7-1 Thermal Characteristics. See Table 10-1 for identification of appropriate weather region. Housing unit construction shall provide at least the minimum R values / maximum U values indicated in Table 7-1 for the appropriate weather region. R and U values shall be calculated in accordance with ASHRAE methods.

TABLE 7-1 – THERMAL CHARACTERISTIC REQUIREMENTS^{1, 2}

Weather Region	Wall ³ R Value	Ceiling / Roof R Value ⁴	Crawl Space R Value ⁵	Basement R Value ⁶	Slab on Grade R Value ⁷	Door R Value ⁸	Glazed Openings U Value ⁹	
							Window	Door
10	2.2 [13]	5.3 [30]	2.2 [13]	0.9 [5]	NR	0.9 [5]	2.9 [0.50]	2.2 [0.38]

Note¹: Metric R values are in square meter-kelvin (K)/watt. [English R values are bracketed, and are in square foot-degrees F/BTUH]. ($R = 1 / U$)

Note²: R values listed represent the minimum acceptable insulation values for each construction type. Listed U values represent the maximum thermal conductance allowed for windows and doors.

Note³: Requirements for opaque, exterior walls.

Note⁴: For buildings with ventilated attics, no credit may be taken for the roof construction. R value shall be computed for construction between conditioned space and ventilated attic or building exterior. Insulation for floors which extend over outside air spaces shall conform to the ceiling and roof requirements.

If cathedral ceilings are being used, the effective R-Value of the overall roof area must meet the required "Ceiling/Roof" performance level. The effective R-Value of the overall roof area can be determined by calculating the weighted average of the R-Values of the different areas (based on the percentage of the total roof area each type covers). For example, if the Ceiling/Roof insulation required was R-38 and 25% of the ceiling was cathedral insulated to R-19, and then the required R-Value for the remaining roof would be: $(38 - 0.25 \times 19) / 0.75 = 44.33$, or R-45 (min).

Note⁵: Requirements for crawl space exterior walls below uninsulated floors.

Note⁶: Requirements for basement wall insulation extending downward 3050 mm [10 ft] from outside finished grade, or downward from outside finished grade to basement floor, whichever is less.

Note⁷: Slab and perimeter insulation not required.

Note⁸: Requirements for opaque doors in exterior walls (insulated metal).

Note⁹: Window requirements for double pane, low emissivity glass windows as specified in paragraph 5-15.3 of this STATEMENT OF WORK. Total Window (including glazing and frame) U values as rated by the National Fenestration Rating Council (NFRC) shall be used. Glazing area in Weather Region 10 shall be limited to 14 percent of the heated floor space. Solar Heat Gain Coefficient in Weather Region 10 shall be limited to 0.40.

7-2 Thermal Insulation.

7-2.1 Characteristics. Thermal insulation shall have a flame-spread rating of 25 or less and a smoke-development rating of 50 or less, exclusive of the vapor barrier, when tested in accordance with ASTM E84. A vapor barrier shall be provided on the warm-in-winter side of exterior wall and ceiling insulation, except in humid areas as defined below. Polyurethane is allowed as an insulation material for slabs and outside concrete or unit masonry walls. It is prohibited as an injected insulation material in walls or floor cavities or within the building envelope.

7-3 Air Infiltration.

7-3.1 To limit air infiltration buildings will be sealed with an air infiltration barrier, installed in accordance with the manufacturer's recommendations. The building envelope shall be caulked, gasketed, weatherstripped or otherwise sealed: around window and door frames, between wall cavities and frames, between walls and ceiling and roof, between walls and floors, at access doors and panels, at utility penetrations through walls, floors, and roofs, and at any other exterior envelope joint which may be a source of air leakage. These steps, in combination with provision of a continuous vapor barrier and sealed ductwork as specified in paragraph 10. shall constitute tight building construction.

7-3.2 A blower door test, performed in accordance with ASTM E 779, Measuring Air Leakage by the Pressurization Method, shall be performed on 15 percent of the project buildings, which have been randomly selected by the Contracting Officer. If buildings are to be turned over in phases, the blower door test shall be performed on 15 percent of the buildings completed in each phase (not to exceed 10 buildings per phase). No additional testing will be required if ALL of the tested buildings pass the test requirements. If less than 100 percent of the tested buildings pass the test, an additional 10 percent of the project buildings (not to exceed 10 buildings) shall be tested. This process shall continue until 100 percent of the total number of tested buildings pass the blower door test. All proto-type units will be included in the required blower door testing procedures.

7-3.2.1 Before beginning the test, all combustion devices shall be turned off, and all intentional openings in the building envelope (dryer vent, bathroom and kitchen exhausts, etc.) shall be sealed. All doors and windows shall be closed and latched.

7-3.2.2 To pass the blower door test, the building shall have an air tightness rating within the range of 3 to 4 ACH at 50 Pa [0.2 inch of water]. The Contractor shall correct all housing units not found in compliance, and shall be responsible for all labor and materials required to reduce air leakage to within acceptable parameters. All testing shall be performed by a firm certified by the Associated Air Balance Council, the National Environment Balancing Bureau, or State licensed to perform such tests within the state where the project is being constructed.

7-3.2.3 Any measures taken to reduce the air leakage to acceptable values shall be permanent, and shall be implemented on all similar housing units.

8. UNIT DESIGN - PLUMBING.

8-1 Plumbing system shall be designed and installed in accordance with the **International Plumbing Code** (IPC). Inspection and testing of the plumbing system shall be performed as prescribed in the Plumbing Code. Additional consideration in the technical evaluation will be given to systems which incorporate measures beyond the requirements of this STATEMENT OF WORK which are designed to increase energy conservation, ease of maintenance, or occupant comfort such as water filtration and purification, higher efficiency water heating systems, higher grade plumbing fixture materials (such as enameled cast iron tubs as opposed to enameled steel or plastic), etc. Plumbing systems shall be designed with consideration to the effects of expansive soils. Specific provision minimizing the detrimental impacts of expansive soil on under slab and underground piping systems shall be identified in the bidders proposals.

8-2 Water Piping. Under slab supply piping shall be limited to housing unit service entrance only. Service line to each housing unit shall be no less than 25 mm [1 inch] diameter. All water piping shall be sized in accordance with methods outlined in the International Plumbing Code, to limit water velocity in the pipe to 2440 mm/sec [8 ft/sec] unless a lower velocity is recommended by the plumbing fixture manufacturer(s). An isometric diagram of the water system shall be included in the design submittal. Allowable pipe materials are listed below:

8-2.1 Copper tubing. Water piping under concrete slabs shall be copper tubing, type K, annealed. Joints under the slabs are prohibited. All interior water supply piping shall be run above grade and shall be copper tubing, type K, L, or M hard-drawn copper. Type M copper tubing shall not be installed in exposed areas where the tubing may be exposed to external damage. Additional consideration in the technical evaluation shall be given to designs using copper types K or L. Fittings for soft copper tubing shall conform to ANSI B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes, and for hard-drawn to ANSI B16.22, Wrought Copper and Copper alloy Solder Joint Pressure Fittings.

8-2.2 Not used.

8-3 Soil, Waste, Vent, and Drain Piping. Soil, waste, vent, and drain, piping may be cast iron, copper, steel, or plastic suitable for installation in a residential waste, soil, vent, and drain system. Each fixture and piece of equipment, except water closets, requiring connection to the drainage system, shall be provided with a trap. Provide deep seal trapped drain for cooling coil condensate drain. Soil, waste, and drain piping installed below floor slabs shall be service weight hub and spigot cast iron. Building waste main lines shall be no less than 102-mm (4-inch) diameter. Building waste main line shall be provided with a two-way cleanout where the line leaves the building. All soil, waste, and drain piping shall be sized in accordance with the methods outlined in the **International (AM#3)** Plumbing Code. An isometric diagram of the sanitary sewer system shall be included in the design submittal.

8-4 Gas Connections. The use of semirigid tubing and flexible connectors for gas equipment and appliances is prohibited, except that the final connections to the kitchen ranges shall be made using flexible connectors conforming to ANSI Z21.45, Flexible Connectors of Other Than All Metal Construction for Gas Appliances, not less than 1000 mm [40 inches] long. Provide accessible gas shutoff valve and coupling for each gas equipment item. Comply with IBC or model code seismic requirements. Exposed horizontal piping shall not be installed farther than 150 mm [6 inches] from the nearest parallel wall in laundry areas or areas where clothes hanging could be attempted. See paragraph 4-5 for gas line distribution requirements.

8-5 Plumbing Fixtures. Fixtures shall be provided complete with fittings, and chromium-plated or nickel-plated brass (polished bright or satin surface) trim. All fixtures, fittings, and trim in a project shall be from the same manufacturer and shall have the same finish.

8-5.1 Plumbing shall meet the following criteria:

8-5.1.1 Exposed traps shall be chromium-plated, adjustable-bent tube, 20-gauge brass. Concealed traps may be plastic (ABS).

8-5.1.2 Faucets shall be single-control type, with seals and seats combined in one replaceable cartridge designed to be interchangeable among lavatories, bathtubs and kitchen sinks. Water flow shall be no more than .158 L/s [2.5 gpm] from any faucet. Kitchen faucets shall have extended height and shall include a retractable spray with hose.

8-5.1.3 Shower and bath combination shall be controlled by a diverter valve. Baths and shower and bath combinations shall be provided with waste fitting pop-up, concealed with all parts removable and renewable through the overflow and outlet openings in the tub. Showers and shower and bath combinations shall be equipped with a combination valve and flow control device to limit the flow to 0.158 L/s [2.5 gpm] at pressures between 137.9 to 413.7 kPa [20 and 60 psi]. Showers valves shall be pressure-balanced mixing valve with integral service stops, Symmons model 96-2 Temptrol, or approved equal.

8-5.1.4 Piping shall be concealed. Individual shutoff or stop valves shall be provided on water supply lines to all plumbing fixtures except bathtubs and showers. Shutoff valves shall be provided for each bathroom group. In multi-story units, additional consideration shall be given in the technical evaluation to designs which provide separate shutoff valves for each floor.

8-5.1.5 Fixtures shall be water conservation type, in accordance with the International Plumbing Code, and shall meet the water conservation requirements of State of Texas and City of San Antonio.

8-5.1.6 Vitreous china plumbing fixtures shall conform to ANSI A112.19.2, Vitreous China Plumbing Fixtures. Stainless steel fixtures shall be in accordance with ANSI A112.19.3, Stainless Steel Plumbing Fixtures (residential design). Plastic fixtures shall not be used. Enameled cast iron plumbing fixtures shall comply with ANSI A112.19.1. Enameled steel fixtures shall not be used.

8-5.1.7 Where tubs are installed in an end-to-end configuration in adjacent bathrooms the shower valve faucet end of the tubs shall not be back to back, but shall be located at opposite ends of the tubs to allow for maintenance and repair.

8-5.2 Water closets. Water closets shall have regular bowl with inclined tank, close coupled siphon jet, floor outlet with wax gasket, closed-front seat and cover, and an anti-siphon float valve. Water consumption shall be no more than 6 L [1.6 gal] per complete flushing cycle. Water closet trim shall conform to ANSI A112.19.5, Trim for Water-Closet Bowls, Tanks, and Urinals (Dimensional Standards).

8-5.3 Lavatories. Lavatories shall be rectangular counter top type, minimum 508 by 457 mm [20 by 18 inches] in size or oval minimum 480 by 410 mm [19 by 16 inches] in size. Lavatories shall be vitreous china or cast iron self rimming. Lavatories shall have pop-up drains.

8-5.4 Bathtubs. Bathtubs shall be slip resistant and shall be constructed of enameled cast iron, porcelain enameled formed steel, or gel-coated, glass fiber reinforced polyester resin with wainscot. Metal bathtubs shall have fiberglass or ceramic tile wainscot. Bathtub wainscot shall extend to a minimum height of 1524mm (60") above finished floor.

Combination bathtub/shower shall have a wainscot to 1980mm (78") above finished floor. Wainscot shall be of ceramic tile over membrane waterproofing on a cementitious substrate; or gel-coated, glass-fiber reinforced polyester.

8-5.5 Showers. Shower stalls shall be of ceramic tile, floor to ceiling, over membrane waterproofing on a cementitious substrate; or gel-coated, glass-fiber reinforced polyester. Shower receptors shall be slip resistant cast stone or slip resistant gel-coated, glass-fiber-reinforced polyester. Shower stall wainscots shall be ceramic tile or gel-coated, glass-fiber-reinforced polyester and shall extend to a minimum height of 1980mm (78") above finished floor.

8-5.6 Kitchen sinks. Kitchen sinks shall be Type 302 stainless steel, 18-gauge minimum, seamless drawn,

and sound deadened. Sinks shall be double bowl, self-mounting without mounting rings, complete with cup strainer and plug. Bowls shall be minimum 230mm (9 inches) deep. Food waste disposers shall be in accordance with UL 430 and ASSE 1008, and shall have a minimum motor size of 370 watts [$\frac{1}{2}$ horse power]. Strainer shall be eliminated where food waste disposers are provided.

8-6 Clothes Washer Connections. Drainage and hot and cold water supply shall be provided for automatic clothes washers. Washer connection, complete with 50-mm [2-inch] drain, 20-mm [$\frac{3}{4}$ -inch] hose thread supplies shall be provided in standard manufactured recessed wall box with single-face plate. Boxes shall be constructed of plastic or sheet steel. Steel boxes shall have a corrosion-resistant epoxy enamel finish. Boxes shall be mounted a minimum of 865 mm [2 ft-10 inches] above the finish floor. Electrical outlets for both washer and dryer shall also be provided.

8-7 Refrigerator Ice Maker Connection. Cold water supply shall be provided for GF refrigerator ice makers. Ice maker connection shall include an angle valve and a $\frac{1}{4}$ inch hose thread supply, and shall be provided in standard manufactured recessed wall box with single-face plate (plastic or steel). Boxes shall be mounted a minimum 2 ft-10 inches above the finish floor.

8-8 Hose Bibbs. Hose bibbs shall be provided at one side and at the rear of each building for each ground level housing unit. Hose bibbs shall be supplied with an integral vacuum breaker. Valve body shall be all brass. Valve handle shall be metal. Valve seats, washers, and stem packing shall be fully serviceable without removal of the valve body. Vacuum breaker shall be brass and shall not have any exposed plastic.

8-9 Piping Location. Water piping running in crawl spaces and attics shall be installed on the warm side of insulation and shall be wrapped with insulation and a vapor barrier jacket. Determination of the warm side shall be the same as determined for vapor barrier location. No water piping runs in exterior walls shall be allowed, except in climates where the 99 percent dry bulb temperature is 1.7 degrees C [35 degrees F] or higher.

8-10 Cleanouts. Cleanouts shall be provided at each change in direction of sanitary sewer lines, at the intervals specified in the National Standard Plumbing Code, and at the building service entrance. All cleanouts shall be permanently accessible. Ground cleanouts shall be two-way type, installed in a 305-mm by 305-mm [12-inch by 12-inch] concrete pad, flush with grade.

8-11 Water Heater. Water heaters shall have round, glass lined tanks, and shall have factory applied insulation having a minimum metric R value of 2.8 (in-lb R = 16). Access shall be provided through the insulation for service and maintenance openings. Storage water heaters that are not equipped with integral heat traps and having vertical pipe risers shall be installed with heat traps directly on both the inlet and outlet. Circulating systems need not have heat traps installed. The water heater temperature and pressure relief valve shall be installed in accordance with code. Water heaters shall be sized in accordance with Table 8-1 for a 32 degrees C [90 degrees F] rise. Water heater energy factors shall meet or exceed the minimum requirements of 10 CFR 430. Additional consideration in the technical evaluation will be given to designs which include water heaters which exceed the minimum energy efficiency requirements and which utilize high efficiency, power vented, or sealed combustion water heaters.

TABLE 8-1 - WATER HEATER SIZING

Requirements by Fuel Type	2 BR	3 BR	4 BR		5 BR	
	1 Bath	2 Bath	2 Bath	3 Bath	2 Bath	3 Bath
Gas & Oil:						
Storage (L [gal])	114 [30]	151 [40]	151 [40]	194 [50]	194 [50]	194 [50]
1 hour draw (L [gal])	227 [60]	265 [70]	273 [72]	310 [82]	341 [90]	341 [90]
Recovery (L/h [gph])	114 [30]	114 [30]	121 [32]	121 [32]	151 [40]	151 [40]

TABLE 8-1 - WATER HEATER SIZING

Requirements by Fuel Type	2 BR	3 BR	4 BR		5 BR	
	1 Bath	2 Bath	2 Bath	3 Bath	2 Bath	3 Bath
Electric:						
Storage (L [gal])	114 [30]	189[50]	189[50]	250 [66]	250 [66]	250 [66]
1 hour draw (L [gal])	167 [44]	273 [72]	273 [72]	333 [88]	333 [88]	333 [88]
Recovery (L/h [gph])	53 [14]	83 [22]	83 [22]	83 [22]	83 [22]	83 [22]

Note: Storage capacity, input, and recovery may vary with manufacturer. Any combination of the above which produces the required hour draw will be acceptable.

8-11.1 Gas fired water heaters shall be in accordance with ANSI Z21.10.1, Water Heaters, Gas, Volume I, Storage Type, 22 kW [75,000 BTUH] Input or less, and shall be high efficiency type. Water heaters with powered ventilation shall be vented in accordance with manufacturer's instructions. Additionally, natural gas-fired heating equipment with a max rated input capacity of 586 kw (2.0 MMBtuh) or less shall be in compliance with Nitrogen Oxide limits as specified in 30 Texas administrative Code, part 1, Chapter 117, Subchapter D, Division 1, Rule 117.465. Gas fired water heaters shall have annual energy use of 246 therms or less based on 10 CFR 430, Subpart B, Appendix E.

8-11.2 Water heaters shall be installed in the mechanical equipment room at floor level. Adequate space shall be available for required clearances as well as proper servicing and removal and replacement without disassembly of any other equipment in the room.

8-11.3 **BID OPTION 1** Electric water heaters shall comply with UL 174, Water Heaters, Household Electric Storage Tank Type, and shall have an Annual Energy Use (kWh) of 4,773 or less based on DOE test procedure 10 CFR430, Sub-Part B, Appendix E. Water heaters shall be connected to the ground coupled heat pump desuperheater.

8-12 Fire Protection. Provide a wet chemical fire extinguishing unit for each kitchen range, mounted in cabinet above or beside the kitchen range exhaust hood. System shall be a minimum 2 ½ lb capacity, stored pressure type with automatic detection of fire and release of extinguishing agent through fixed nozzles. System shall provide pressure actuated shutoff of range energy source (either gas or electric) and shall include an audible discharge alarm. System shall be UL listed "Residential Range Top Extinguisher Unit". System shall be "The Guardian" as manufactured by Twenty First Century International Fire Equipment and Services Corporation of Irving, Texas, or approved equal.

9. UNIT DESIGN - ELECTRICAL.

9-1 Conformance to Code. The electrical system shall be designed in compliance with the rules and recommendations of ANSI C2, National Electrical Safety Code; NFPA 70, National Electrical Code (NEC); **(AM#4)** and applicable model codes, whichever is more stringent. Provide main circuit breaker in the main panel for each dwelling unit, sized in accordance with the NEC.

9-2 Service Entrance. Service entrances, exterior meters, and panels shall be enclosed or sight screened. Service feeders shall be underground with exterior meters. Panel boards shall be dead front, painted galvanized steel, and furnished with main breakers. Panel board doors shall be flush one-piece fronts. Panel boards may be surface or recessed mounted depending on their location. In hallways, panel boards shall be recessed. Back-to-back panel boards shall be offset a minimum of 400 mm [16 inches] horizontally. Tandem circuit breakers shall not be used. Printed labels, in the panel board, shall be provided for all installed circuits. Recessed panel boards are not to be located in party walls and fire walls.

9-3 Panel Board Locations. Each dwelling unit shall have it's own distribution panel board. Panel boards shall be located in the utility/laundry room, or hallway.

9-4 Conductors. Conductors shall be copper and not smaller than #14 AWG.

9-5 Outlet Circuits. All general receptacle and lighting circuits shall be 15 Ampere circuits, fed by 15 Ampere circuit breakers unless noted otherwise. Receptacles on opposite sides of common walls shall be horizontally offset a minimum of 300 mm (12 inches) to maintain the integrity of the fire wall and sound deadening rating of the wall.

9-5.1 Separate Circuits. Lighting and receptacles shall be on separate branch circuits. Where half-switched receptacles are installed for auxiliary cord-connected lighting, the entire receptacle shall be fed from the same circuit. Such circuits may be either lighting or receptacle circuits.

9-5.2 Outlets Per Circuit. Circuits for lighting or general purpose receptacles shall be limited to a maximum of six (6) current consuming outlets. This requirement shall supersede any others.

9-5.3 Outlet grounding. All equipment, appliances, lighting fixtures, and receptacles shall be grounded by an equipment grounding conductor which shall be terminated at a grounding screw in the outlet box. A grounding jumper shall connect the equipment, fixture, or receptacle to this grounding screw.

9-6 Exterior Lighting. Provide energy efficient high quality lighting for each housing unit. The minimum efficiency standard for lighting is 50 lumens/watt. This efficiency can be achieved with fluorescent and compact fluorescent lighting. Lighting must also be color corrected with a Color Rendering Index (CRI) of 60 or better. Provide a minimum of one lighting fixture in each dwelling unit's entry, carport, and patio or balcony area(s). Light fixtures at entry and patio or balcony areas shall be switched from the dwelling unit interior. Provide a fixture in the patio area, except that the patio area light shall not be provided where the patio is adjacent to an exterior entrance and is adequately served by the lighting fixture required herein before.

9-7 Interior Lighting and Switched Outlets.

9-7.1 Efficiency. Interior lighting will be both efficient and color corrected. Color Rendering Index (CRI) of 85 or better and a standard lighting color of 3500 K are required. Incandescent fixtures are not allowed. Minimum efficiency standard for lighting are as follows:

9-7.1.1 Fluorescent tubes 1220 mm [4 ft] and longer: 90 lumens/watt.

9-7.1.2 Fluorescent tubes less than 1220 mm [4 ft]: 80 lumens/watt.

9-7.1.3 Compact fluorescent and other lamps: 50 lumens/watt.

9-7.2 Locations. Provide light fixtures operated by wall switches for all rooms except living rooms. Living room shall have a convenience duplex receptacle, half controlled by a wall switch, located at the room entrance. Wall-switch operated ceiling lights shall be provided in dining and utility rooms, halls, bedrooms, kitchens, and dinette areas. Additional light fixtures shall be provided in rooms whose configuration requires them for adequate lighting. Wall-switch operated wall-mounted lights shall be provided in bathrooms and half baths located above the mirror over the lavatory. Walk-in closets and interior and exterior bulk storage rooms shall be provided with ceiling lights, either wall switch or pull-chain operated. A minimum of one lighting fixture, ceiling or wall mounted, as appropriate, shall be provided in the carport.

9-7.2.1 Dining room ceiling light fixtures (hanging type) shall be movable by means of a track, chain and hooks, or other means in order to accommodate other than the typical dining room furniture arrangement. Fixtures may be designed for incandescent use, and do not have to meet the 50 lumens/watt requirement. A ceiling fan with integral lighting fixture may be substituted for this requirement.

9-7.2.2 The general lighting intensity in kitchens shall be 320 to 540 Lx [30 to 50 foot-candles]. Supplementary lighting shall be provided at the sink and under one of the wall cabinets for a work center to produce a composite lighting level of 810 Lx [75 foot-candles] using either down-lights, surface-mounted fluorescent fixtures below wall cabinets or wall-mounted fixtures (1520 mm [5 ft] and higher above the floor) as appropriate. Kitchen range hood shall be provided with a light, fan, and switches.

9-7.2.3 The ceiling mounted light fixtures in the living room, family room (if provided), dining room, and all bedrooms shall be provided with a metallic fixture box suitably supported from the ceiling structure so that it may support a ceiling fan. Additional wiring and a switch shall also be provided next to light switch to allow for independent wall switch control of the fan and light.

9-8 Smoke Detectors. A household fire warning system, per NFPA 70, National Electrical Code; NFPA 72, National Fire Alarm Code; and NFPA 101, Life Safety Code, shall be installed in each unit. Hard-wired smoke detectors shall be located and installed on the ceilings of each dwelling unit in accordance with the requirements of NFPA 70, 72, 101, and UL 217. Each sleeping room shall have a separate smoke detector. All smoke detectors shall be of the photoelectric type. All smoke detectors shall have audible annunciation using the temporal 3 pattern. Smoke detectors in handicapped adaptable units shall also have visual annunciation with a 177 Candela rating. The mounting bases shall be permanently wired and supplied by a dedicated circuit. Circuit breaker for smoke detector circuit shall be clearly labeled and provided with a warning for occupants not to shut off. All smoke detectors within a living unit shall be interconnected so that operation of any smoke detector shall cause the alarm audio and visual devices in all smoke detectors in that unit to activate. All smoke detectors shall be interconnected with battery backup. Smoke detectors shall not be located near air exchange vents. Additional consideration in the technical evaluation will be given to designs that provide smoke detectors with pull out trays for changing batteries. This type of smoke detector allows the occupant to change the battery without having to remove the detector from its mounting. Activation of a smoke alarm shall not cause activation of a carbon monoxide alarm.

9-9 Carbon Monoxide Alarms. Provide carbon monoxide (CO) alarms equipped with a fuel burning appliance inside of the dwelling unit. Activation of a CO alarm shall not cause activation of a smoke alarm. CO alarms will be provided as follows:

9-9.1 One CO alarm shall be located on each level of the dwelling unit. A required alarm shall be located in vicinity of the bedrooms, such as in the corridor outside of the bedrooms. CO alarms will not be provided in furnace rooms or unfinished attics.

9-9.2 CO alarms shall be hard-wired and wall-mounted at the same height as the thermostat, approximately 1.3 m [52 inches] off the floor. Dead air spaces such as corners shall be avoided. Units may be powered from circuits powering smoke detectors. In all cases, manufacturer's guidelines and recommendations shall be followed.

9-9.3 CO alarms shall be equipped with an audible alarm, continuous digital display, peak level memory, test button, and test reset button and shall be UL listed by passing standard test UL 2034.

9-10 Telephone. Provide dual jack outlets in family room (if provided), living room, and each bedroom of each dwelling unit. Provide a single jack outlet in the kitchen. Eight position modular jack connectors shall be provided. The jack provided in the kitchen shall be for a wall-mounted phone. Wiring methods shall comply with EIA/TIA Standard 570, Residential and Light Commercial Telecommunications Wiring Standard. Cable and jacks shall be Category 5e per TIA/EIA 568A, Commercial Building Telecommunications Cabling Standard. Cable shall be unshielded twisted pair (UTP), #24 AWG, solid copper station. Each dwelling unit shall be pre-wired separately from other dwelling units in the same building. All wiring shall terminate in a surface mounted, weatherproof, protected telephone terminal ("Demarcation Box") located on an outside wall adjacent to the building electric metering equipment. Each dwelling unit shall have a protected telephone terminal. The protected telephone terminal cover shall be provided with means for padlocking, shall be accessible from the outside, and shall be permanently labeled, "Telephone". Gas protected telephone terminals shall be provided for all incoming phone lines. A single #10, CU, green equipment grounding conductor shall be run in 16 mm (1/2-inch) non-metallic conduit from the electric metering equipment to the protected telephone terminal box. Home run style wiring shall be utilized between each jack and the protected telephone terminal. 4-pair cable shall be home run from each outlet except 2-pair cable may be used for kitchen outlet. No circuits shall be routed on the interior or exterior surfaces of dwelling units, or on the surfaces of walls in other structures. Outlet boxes shall be 117 mm (4-11/16 inches) square by 53 mm (2-1/8 inches) deep. Sizes of protected telephone terminals shall be coordinated with local Telephone Company.

9-11 Commercial Cable Television. Cable Television (CATV) outlets shall be located in the kitchen, living room, family room (if provided), and bedrooms. A minimum of two outlets shall be provided in the living room to allow flexibility in furniture layout. Outlets shall be located next to telephone jacks (kitchen excluded) to allow connection of a satellite receiver. Each dwelling unit shall be pre-wired in conformance with all local CATV company requirements. Each dwelling unit shall be pre-wired separately from other dwelling units in the same building. All wiring shall terminate on an 8-output coupler located inside a surface mounted, weatherproof, protected television terminal ("Demarcation Box") located on an outside wall adjacent to the protected telephone terminal. Each dwelling unit shall have a protected television terminal. The protected television terminal cover shall be provided with means for padlocking, shall be accessible from outside and shall be permanently labeled "Television". A single #10, CU, green equipment grounding conductor shall be run in 16 mm (1/2-inch) non-metallic conduit from the electric metering equipment to the protected television terminal box. Home run style wiring shall be utilized between each jack and the protected television terminal. Cable shall be RG-6 with minimum coverage of 67%. Type of tap offs, and sizes of protected television terminals and outlet boxes shall be coordinated with local cable TV Company. Local TV Company is Time Warner and the POC is Mr. Peter Perez at 210-352-4466. E-mail address is peter.perez@twcable.com.

9-11.1 Satellite Television. Provide two home run coax cables (one set per dwelling unit) from protected television terminal to exterior mounted satellite dish bracket (as described in architectural section 5). Cables shall be type RG-6 with minimum coverage of 67% and shall be completely concealed except for the length between where the cables exit the house and the bracket. This exposed length shall be minimized to the largest extent possible, but sufficient slack shall be provided to allow easy connection to an occupant installed dish. Sufficient slack shall also be provided within the protected television terminal to allow connection to any of the 8-output coupler's jacks. Type F male connectors shall be provided on the ends of both cables.

9-12 Doorbell. The front entrance to each dwelling unit shall be provided with a low voltage bell or buzzer. Doorbell shall be hard-wired. Handicapped adaptable dwelling units shall also be provided with hook up provisions for future installed wall-mounted strobe visual annunciators in the entry hallway and kitchen.

9-13 Convenience Receptacles. In addition to receptacles required by NEC, provide convenience receptacles in the following areas:

9-13.1 Equipment room

9-13.2 Hallway outside bedrooms

9-14 Special Receptacles. Provide 240 V electric receptacles for electric dryer (this is in addition to the 120 V receptacle required for a gas dryer) and electric range. Provide a switched 120 V receptacle under kitchen sink for garbage disposal.

9-15 Wiring. Maximum use shall be made of nonmetallic-sheathed cable for branch circuit wiring, and of service entrance cable for heavy-duty interior circuits and for service entrance conductors. Installed conductors in conduit shall be used only where specifically required by the NEC except that all exposed electrical wiring shall be put in steel metal conduit and receptacle boxes.

9-16 Branch Circuit Conductors. Branch circuit conductors and over current devices shall be as rated by NEC. A minimum of one spare circuit space in the panel shall be provided per dwelling unit. Individual circuits shall be provided for the clothes washer, clothes dryer (with receptacles located behind the washer and dryer), dishwasher, garbage disposal, freezer, electric range, furnace or air handling unit, air conditioning unit, and water heater. Two utility circuits (20 amp utilizing #12 AWG wire) shall be provided in the kitchen area for the convenience outlets for small appliances serving the kitchen, dining area, and family room area. The furnace or air handling unit and the air conditioning unit shall be provided disconnect switches in addition to the branch circuit breaker.

9-17 Exterior Receptacles.

9-17.1 One duplex receptacle shall be provided in each dwelling unit's entry, carport, and patio or balcony area(s).

9-17.2 One duplex receptacle, fed and switched with the front entrance door light, shall be provided for holiday lighting. This is in addition to the one required by paragraph 9-17.1.

9-17.3 Receptacles shall have weatherproof "Taymac" type covers that are rated NEMA 3R with a plug cord attached.

9-18 Ground Fault Protected Receptacles. All receptacles that are required to have ground fault protection shall be fed by a ground fault interrupting circuit breaker except that the dedicated receptacle in the bathroom shall itself be the ground fault interrupting type.

10. UNIT DESIGN - HEATING, VENTILATING, AND AIR CONDITIONING.

10-1 Design. Heat gain and loss calculations shall be, as a minimum, in accordance with the current edition of the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals or ACCA Manual J. The cooling load calculations shall be in accordance with ASHRAE Residential Cooling Load Calculations. Computer-generated load calculations shall be provided, and shall include complete input and output summaries. Design shall be based on the weather data shown in Table 10-1 and Table 10-2. HVAC system shall be designed to minimize noise transmitted to the habitable space. The design noise criteria (NC) shall be no greater than 40 in any habitable space.

TABLE 10-1 – WEATHER DATA¹

Type of Design / Design Information	Metric	Inch-pound
Weather Region	10	
Heating ²		
Indoor Design Temperature	21 °C	70 °F
Outdoor Design Temperature	-1 °C	30 °F
Annual Heating Degree ³ Days	870	1570
Largest Number of Monthly Heating Degree Days ³	278	500
Cooling		
Indoor Design Temperature	24 °C	75 °F
Outdoor Design Dry Bulb Temperature	36 °C	97 °F
Outdoor Design Wet Bulb Temperature	24.5 °C	76 °F

Note¹: From TM 5-785, Engineering Weather Data.

Note²: Bin weather data is available from TM 5-785, Engineering Weather Data.

Note³: Metric data are based on Celsius degree days to a base of 18 degrees C. Inch-pound data are based on degree days Fahrenheit to a base of 65 degrees F.

TABLE 10-2

BIN WEATHER DATA FOR FORT SAM HOUSTON, TEXAS	
TEMPERATURE RANGE, C (F)	ANNUAL OBSERVATION, HRS
40/43 (105/109)	0
38/40 (100/104)	20
35/38 (95/99)	195
32/35 (90/94)	423
30/32 (85/89)	593
27/30 (80/84)	847
24/27 (75/79)	1375
21/24 (70/74)	1121
18/21 (65/69)	918
16/18 (60/64)	760
13/16 (55/59)	636
10/13 (50/54)	594
7/10 (45/49)	481
4/7 (40/44)	371
2/4 (35/39)	237
-1/2 (30/34)	121
-4/-1 (25/29)	46
-7/-4 (20/24)	12
-9/-7 (15/19)	2
-12/-9 (10/14)	1
-15/-12 (5/9)	0

NOTE: Data from TM 5-785, Engineering Weather Data

10-1.1 Load calculations. Computer generated load calculations shall be performed for each possible orientation up to four representative orientations for each building type included in the project. Room air flow requirements shall be computed based on the individual room load. However, the minimum acceptable air flow

shall be 2.5 (L/s)/m² [0.5 cfm/ft²] for all spaces. The design for each individual housing unit shall be based on the heating and cooling loads as well as room airflow requirements computed for the building type and orientation which it most closely matches. Internal loads shall be included in the computerized load calculations in accordance with ASHRAE recommendations for residential analyses.

10-1.2 Duct system layout. For a given building type, a single duct layout may be used regardless of orientation, provided that the system is sized to provide the required air flow for each room at its worst case orientation. Balancing dampers shall then be used to reduce air flow to the appropriate level as required. Permanent access to dampers shall be provided.

10-2 Equipment Safety and Efficiency. All materials and equipment shall be the standard cataloged product of manufacturer's regularly engaged in production of such materials and equipment, and shall be the manufacturer's latest standard design. Each major component of the heating [and cooling] system[s] shall have the manufacturer's information on a plate secured to the equipment.

10-2.1 All heating and cooling equipment proposed and installed in this contract shall bear the Energy Star Label.

10-2.2 Equipment shall comply with the requirements of American Gas Association (AGA), American National Standards Institute (ANSI), Air Conditioning and Refrigeration Institute (ARI), American Society for Testing and Materials (ASTM), Gas Appliance Manufacturers Association (GAMA), National Electric Manufacturers Association (NEMA), National Fire Protection Association (NFPA), Underwriters Laboratories, Inc. (UL) or other national trade associations as applicable.

10-2.3 Equipment efficiencies as listed in Table 10-3 below are minimum acceptable levels. Energy conservation as it relates to equipment operating costs will be considered in the evaluation process. Additional consideration in the technical evaluation will be given to designs which include higher than minimum efficiency equipment.

TABLE 10-3 - MINIMUM EQUIPMENT EFFICIENCIES

	Natural gas fired equip	Electric heat pump (ground coupled)	Electric cooling only split DX cond. Unit and matched coil
Furnace AFUE	90% ¹		
Heating Mode COP		4	
Cooling EER ²		12.7	10
SEER ³		15	12.7

Note¹: Efficiency is based on DOE test procedure 10CFR430, Sub-Part B, Appendix N.

Note²: EER measured in accordance with ARI 210/240 at rating conditions.

Note³: Efficiency is based on DOE test procedure 10CFR430, Sub-Part B, Appendix M.

10-3 Heating and Cooling Systems. Each housing unit shall be provided with central heating and air conditioning system[s]. Systems shall be designed, installed, balanced, and adjusted to distribute heat and cooling to all habitable rooms, as well as bathrooms, in proportion to the calculated load requirements of these spaces. Fans in air handlers and furnaces shall be multi-speed, direct drive type. Fans in air handlers and furnaces shall not be variable-speed type. System installation shall conform to SMACNA Installation Standards for Residential Heating and Air Conditioning Systems except as altered by this document. Additional

consideration in the technical evaluation will be given to systems utilizing modular components, plugged power, stainless steel heat exchangers, drawer-type burner assemblies, additional space in the mechanical room, and other features which contribute to ease of system maintenance. Additional consideration will also be given to designs which provide measures beyond the requirements of this STATEMENT OF WORK to increase energy conservation or occupant comfort such as division of each housing unit into more than one conditioning zone for increased control.

10-3.1 Equipment sizes selected for installation shall not be oversized more than 125 percent of the calculated loads (exception, gas fired furnace heating capacity may exceed 125 percent of the calculated heating load in order to match air handler selection with required cooling loads).

10-3.2 Mechanical space shall be provided to house all mechanical equipment. Exterior air conditioning units shall be concrete pad-mounted, with location selected based on site specific conditions and intended uses of outdoor space. Effort shall be made to locate the unit(s) out of the occupant's direct line of sight (screen with shrubbery or wall, locate on sides of housing unit, avoid placement under windows, etc.). However, the primary concern shall be coordination with the mechanical area location. Mechanical equipment shall be located in an externally accessible equipment room, and shall be arranged to allow for ease of maintenance, and for proper venting if required. This equipment room shall be provided with a light and electrical receptacle. The mechanical equipment room shall be a part of the dwelling structure. The mechanical equipment room shall be provided with a floor drain to accept condensate. The mechanical equipment room shall have a depressed floor to prevent condensate or leakage from entering the dwelling. The mechanical equipment room shall have a concrete pad outside the access door. Mechanical equipment shall not be located in attic spaces. A desirable feature is to locate the mechanical equipment access on the side of the dwelling or otherwise accessible without traversing areas that may be fenced. See paragraph 5-6.3 for additional requirements for mechanical spaces containing fuel-fired heating equipment.

10-3.3 Forced warm air systems. Warm air furnaces shall be induced combustion, upflow, high efficiency, natural gas furnaces. Furnaces shall be equipped with electronic ignition. High efficiency (AFUE > 90 percent) gas furnaces shall be vented in accordance with AGA requirements and the manufacturer's instructions. Condensate drains for high efficiency units shall be manufacturer approved, and shall be indirectly connected to the building sanitary sewer system. Combustion air shall be provided from the outside in accordance with the appliance listing. Furnaces shall be equipped with centrifugal fan, disposable filters, controls, and transformer. Fans shall be multi-speed, direct-drive type. It shall be possible to service and replace all controls and internal components from one side of the furnace. Heat exchangers shall be guaranteed for a minimum service life of 10 years. Furnaces shall be equipped with a cooling coil by the same manufacturer, matched to the selected air conditioning equipment.

10-3.4 Not used.

10-3.5 Split system air conditioning:

10-3.5.1 Electric air conditioning equipment shall consist of an air-cooled condensing unit and evaporator as matched components with the furnace, all by the same manufacturer. Refrigerants used shall have an Ozone Depletion Potential (ODP) of .05 or less. The condensing unit shall contain, as a minimum, the features indicated in Table 10-4. Equipment shall be sized to meet the total load determined by computer calculation. Equipment may be oversized to no more than 125 percent of the computer generated load. Fans shall be multi-speed, direct drive type.

TABLE 10-4 – SPLIT SYSTEM AIR CONDITIONING & HEAT PUMP FEATURES

High and low pressure compressor protection.
Filter-drier.
Hermetically sealed compressor with built-in overloads and locked rotor protection.

TABLE 10-4 – SPLIT SYSTEM AIR CONDITIONING & HEAT PUMP FEATURES

Electric crankcase heaters.
Start and run capacitors.
Anti-short-cycle timer. (factory installed)
Testing and charging refrigerant connections.
Compressor guaranteed for a minimum service life of 5 years.
Fan and coil guards.

10-3.5.2 The evaporator coil shall be provided with a liquid strainer, expansion device, pre-insulated housing, copper or aluminum coil, and insulated condensate drain pan. Coil face velocity shall be limited to 2.8 m/s [550 fpm].

10-3.5.3 The condensing unit and matched coil shall deliver a Seasonal Energy Efficiency Rating (SEER), consistent with the minimum requirements shown in Table 10-3.

10-3.5.4 Not used.

10-3.5.5 Refrigerant Charge Verification: When split-system air conditioning systems are selected for installation, the contractor shall check, calibrate, and charge the refrigerant system following installation and start-up of the equipment. These tests shall be accomplished on the same 15% of the units which undergo blower door and duct tightness testing. If the tested units show a low or excessive refrigerant charge, all new systems shall be checked after start-up, but prior to acceptance by the Government.

10-3.6 **Bid Option 1** Ground Coupled Heat Pumps: In lieu of gas fired warm air furnace, split system electric cooling, and gas fired water heater, Bid Option 1 shall provide ground coupled heat pump for heating and cooling and electric water heater coupled to a desuperheater for water heating.

10-3.6.1 One ground-coupled heat pump shall be provided for each living unit. Units shall be rated in accordance with ARI 330 GSHP (Closed Loop). Units shall have a head loss of not more than 36 kPa (12 feet of water) at the flow rate used to obtain the ARI 330 rating. Units shall have extended range capability to include entering liquid temperature down to 0 degrees C (32 degrees F) in heating and up to 38 degrees C (100 degrees F) in cooling. Units shall be located in the externally accessed utility room adjacent or close to the domestic water heater. A desuperheater shall be provided to use the Ground-Coupled Heat Pump as a heat source for domestic hot water during the cooling season. A 10 kilowatt (minimum) emergency backup electric resistance duct heater shall be incorporated into the system design for each unit.

10-3.6.2 The loop piping shall be PE3408 (high density polyethylene) with minimum cell classification 355434C per ASTM D 3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials. The piping shall experience 0 failures after 5,000 hours under condition "C" (100 percent reagent at 100 degrees C) when tested in accordance with ASTM D 1693, Standard test method for environmental Stress-Cracking of Ethylene Plastics. A 50 year limited warranty must be issued by the pipe manufacturer. U-type fittings shall be shop fabricated under quality controlled conditions of the same material designation. Joining shall be by the butt fusion or saddle (sidewall) fusion method in accordance with the manufacturer's Heat Fusion Qualification Guide. Ground loops shall be installed by a certified installer, trained by the International Ground Source Heat Pump Association or factory trained by the ground coupled heat pump manufacturer. A certified fusion technician will perform all pipe fusions. Bore shall be vertical with a minimum 6 meter (20 feet) separation. Bores shall be fully backfilled with thermally enhanced grouts (Bentonite-Quartzite mixture).

10-3.6.3 Design of closed-loop ground source heat pump shall conform to ASHRAE publication, Design/Data Manual for Closed-Loop Ground-Coupled Heat Pump Systems. Accurate calculations supporting the units selected, sizing of pumping modules, bore pipe sizing and bore depth shall be provided. Based on ore data at the site, the bore depth (AM#2) is expected to be a minimum of 29.5 meters per kW (340 ft per ton) of cooling at the site. The Contractor shall verify bore depths (AM#2) by performing a soil thermal conductivity test at the site. Total bore length per ground coupled heat pump unit shall be as determined by applying the calculated length per ton to the installed nominal tonnage per unit and not the calculated unit design load.

10-3.6.4 Contractor shall use mandatory specification section 15741 Vertical Ground-Coupled Heat Exchanger System (VGCHES).

10-3.7 Not used.

10-3.8 Not used.

10-3.9 Not used.

10-3.10 Unacceptable systems. Room unit heaters, space heaters, room (window) air conditioning units, floor furnaces, gravity warm air systems, and electric resistance heaters are not permitted.

10-4 Air Distribution. Provide systems conforming to the recommendations of the ASHRAE Air Distribution Manual or the SMACNA Residential Comfort System Installation Standards Manual. For two-floor housing units with a single air conditioning unit, provide separate, main supply ducts with volume control dampers for each floor. These main ducts shall be run directly from the air handler or furnace to the appropriate building level. As a minimum, provide a separate ducted return for each floor level. Two-floor housing units with 93 m² [1,000 ft²] or greater net floor area on each floor shall be provided with a separate heating and cooling unit and supply and return ducted system for each floor. Additional consideration in the technical evaluation will be given to designs which incorporate air distribution systems totally within the conditioned envelope.

10-4.1 Supply diffusers. Wall, ceiling, and/or baseboard supply diffusers shall be located to ensure that the air distribution will completely cover all surfaces of exterior walls with a blanket of conditioned air. At least one diffuser shall be provided in each habitable room. Diffusers shall have louvered faces with individually adjustable blades, and shall be provided with integral opposed blade damper. Diffusers shall be provided with air deflectors as required for proper air flow in the space. Plastic diffusers are prohibited. Core velocity shall be limited to 3 m/sec [600 fpm] maximum, with a maximum pressure drop of 0.82 Pa/m [0.1 inch water]. Airflow from any single diffuser shall be limited to 94.4 L/s [200 cfm] maximum. Ceiling mounted units shall have factory finish to match ceiling color, and be installed with rims tight against ceiling. Sponge-rubber gaskets shall be provided between ceiling or wall and surface-mounted diffusers for air leakage control. Diffuser boots shall be sealed tight to the wall or ceiling they penetrate using duct mastic or caulking. Suitable trim shall be provided for flush- mounted diffusers. Duct collar connecting the duct to diffuser shall be airtight and shall not interfere with volume controller. Wall supply registers shall be installed at least 150 mm [6 inches] below the ceiling. Supply diffusers shall not be located within 1.5 m any light fixture or fixture box intended for future ceiling fan installation.

10-4.2 Return and exhaust grilles. Grilles shall be fixed horizontal or vertical louver type similar in appearance to the supply diffuser face. Plastic units are prohibited. Core velocity shall be limited to 2 m/sec [400 fpm] maximum, with a maximum pressure drop of 0.5 Pa/m [0.06 inch water]. Grilles shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Register/grille boots shall be sealed tight to the wall or ceiling they penetrate using duct mastic or caulking. Wall return grilles shall be located at least 150 mm [6 inches] above the floor. Return grilles shall be located in hallways, finished basements, or other normally unoccupied spaces to minimize the sound level in occupied spaces. Return grilles shall not be located immediately adjacent to furnace return air plenum. Return grilles shall not be locate low in a wall location that may be blocked by furniture such as sofa of bed headboards. **A desirable feature is filter frames in return grilles allowing filter maintenance from inside the living unit.**

10-4.3 Ductwork. Ductwork shall be externally insulated sheet metal or flexible metal. Length of flexible duct shall be limited to 1.8 m [6 ft]. Flexible ductwork shall not be spliced or joined and shall be a single continuous piece from diffuser boot to trunk/branch duct. Systems composed entirely of flexible ductwork with distribution boxes are prohibited. Sub-slab, intra-slab, or crawlspace ductwork is also prohibited. Volume dampers shall be provided at each branch take-off. All ductwork shall be concealed. No portion of the building construction (such as joist space in a floor or ceiling, wall stud space, etc.) shall be used as a duct. The requirements for ductwork set forth below apply to all ductwork installed in the housing unit, supply systems, return systems, exhaust systems, ventilation systems, and outside air supply ductwork.

10-4.3.1 Maximum velocity in supply ducts shall be limited to 4.6 m/s [900 fpm] for mains and 3.1 m/s [600 fpm] for branches.

10-4.3.2 Ducts shall be airtight with no visible or audible leaks to ensure quiet, economical system performance. Ductwork in conditioned spaces shall be constructed for a 250 Pa [1 inch] static pressure construction class with seal class C, as described in the SMACNA HVAC Duct Construction Standard, unless a higher pressure class and/or seal class is required by actual, system operating conditions. Ductwork in unconditioned spaces shall be constructed for a 500-Pa [2-inch] static pressure construction class with seal class C, unless a higher pressure class and/or seal class is required by actual, system operating conditions. All duct seams and joints shall be sealed using duct mastic. Tape shall not be used as a means for sealing ductwork.

10-4.3.3 For flexible ductwork, the inner core shall be mechanically fastened to all fittings, preferably using drawbands installed directly over the inner core and beaded fitting. If beaded fittings are not used, then the inner core shall be fastened to the fitting using #8 screws equally spaced around the diameter of the duct, and installed to capture the wire coil of the inner liner (3 screws for ducts up to 300 mm [12 inch] in diameter and 5 screws for ducts over 300 mm [12 inch] in diameter). The inner core must be sealed to the fitting using mastic or tape. Tape used for sealing the inner core shall be applied with at least 25 mm [1 inch] of tape on the duct lining and 25 mm [1 inch] of tape on the fitting, and shall be wrapped at least three times. The outer sleeve (vapor barrier) must be sealed at connections with a drawband and three wraps of approved tape. The vapor barrier must be complete without any holes or rips, and seams shall be sealed with mastic or approved tape. Pressure sensitive tapes used in conjunction with flexible duct connections shall be as recommended by the duct manufacturer and shall be UL 181A listed and so indicated with a UL 181A mark or aluminum-backed butyl adhesive tape (15 mil minimum). Drawbands shall be stainless steel worm drive hose clamps or UV resistant nylon duct ties.

10-4.3.4 Provide a minimum of 51-mm [2-inch] thick mineral fiber insulation (or other listed insulation with an equivalent R value) on the exterior of all ducts in unconditioned spaces. Exhaust ductwork does not require insulation. Insulation shall be faced with a vapor barrier material having a performance rating not to exceed 1.0 perm. Insulation, vapor barrier, and closure systems shall be non-combustible as defined in NFPA 255, with a flame-spread rating of not more than 25, and a smoke development rating of not more than 50, as defined in ASTM E-84.

10-4.3.5 Return, exhaust, and ventilation air ductwork shall be sized for a maximum velocity of 4.6 m/sec [900 fpm]. Short runs of return air duct (1525 mm [5 ft] or less) which directly precede the air handler or furnace shall be acoustically lined to minimize noise.

10-4.4 Not used.

10-4.5 Filtration. Provide a pleated 25 mm [1 inch] panel filter, sized for and installed in the return air system in accordance with UL 900. Filter shall be rated for 20 percent efficiency as determined by ASHRAE 52, Method of Testing Air Cleaning Devices used in General Ventilation for Removing Particulate Matter. All filters shall be easily accessible for changing and maintenance and shall be installed in the return grilles whenever possible. Additional consideration in the technical evaluation shall be given to designs utilizing electrostatic filters. Kitchen exhaust hoods shall be provided with aluminum grease filters sized to fit the exhaust duct.

10-5 Thermostats and Humidistats. Thermostats shall be located on interior partitions, approximately 1530mm [5 ft] above the finished floor. Locating a thermostat on the wall adjacent to a stairway, on an exterior wall, or where it is subject to unrepresentative temperatures is unacceptable.

10-5.1 Thermostats shall be Energy Star labeled, microprocessor-based, with built-in key pads for scheduling of day and night temperature settings. Thermostats shall be programmable for heating only, cooling only, or heating and cooling as required. When out of the scheduling mode, thermostats shall have continuous display of time, with AM and PM indicator, continuous display of day of week, and either continuous display of room temperature with display of temperature set point on demand, or continuous display of temperature set point with display of room temperature on demand. In the programmable mode, the display shall be used for setting and interrogating time program ON-OFF set points for all 7 days of the week. The time program shall allow two separate temperature-setback intervals per day. Thermostats shall have a means for temporary and manual override of the program schedule, with automatic program restoration on the following day. Thermostats shall have a replaceable battery to maintain the timing and maintain the schedule in memory for one year in the event of a power outage. Maximum differential shall be ± 1 degree C [± 2 degrees F]. For a listing of Energy Star labeled thermostats see <http://www.epa.gov/appdstar/hvac/thermostats.html>.

10-6 . Not used.

10-7 Exhaust Fans. Kitchen range hood exhaust fans shall be ducted to the outside. Exhaust fans shall not discharge near the air conditioning condensing unit, entry doors, patio or balconies, carports **(AM#4)**. Fans shall be tested and rated in accordance with AMCA 210, and shall operate with 120-volt, single-phase power supply. Exhaust fans shall be provided with backdraft damper. **(AM#3)**. Kitchen range exhaust fans shall be two-speed, and shall be sized for an exhaust rate of 7.6 (L/s)/m^2 [1.5 cfm/ft^2]. Maximum allowable noise level for range hood exhaust fans shall be 6 sones as installed.

10-8 Dryer Vents. A 100-mm [4-inch] diameter dryer vent shall discharge to the exterior, and provide connection to occupant-owned dryer (one dryer per vent). The vents shall be rigid aluminum with exterior wall cap and backdraft damper. Vent pipes shall be a maximum of 6100 mm [20 ft] long, with no more than three right angle elbows (with minimum radius of 150 mm [6 inches]), and have a maximum vertical run of 3660 mm [12 ft]. Dryer vents shall not exhaust near the air conditioning condensing unit, entry doors, patio or balconies, carports **(AM#4)**. Dryer vents shall not run through non-accessible spaces **(AM#4)**. **A desirable feature is horizontal dryer venting. Vertical dryer venting through roof is discouraged.**

10-9 **Ceiling Fans. Provision of ceiling fans is encouraged as a means of increasing occupant comfort, and as an aid to improve the performance of heating and cooling systems. Ceiling fans with lights may be substituted for ceiling fixture requirements in bedrooms, dining room, living room, and family room. Ceiling fans will be low profile 1050 – 1350 mm (42-52 inch), four blade type. Motors shall be three speed reversible, with air volume range between 600 and 3300 l/s (1300 and 7000 cfm) and speeds between 75 and 225 rpm. Maximum power consumption shall be 80 watts and 0.7 amps. Manufacturer's 20 year warranty is required. (AM#2)**

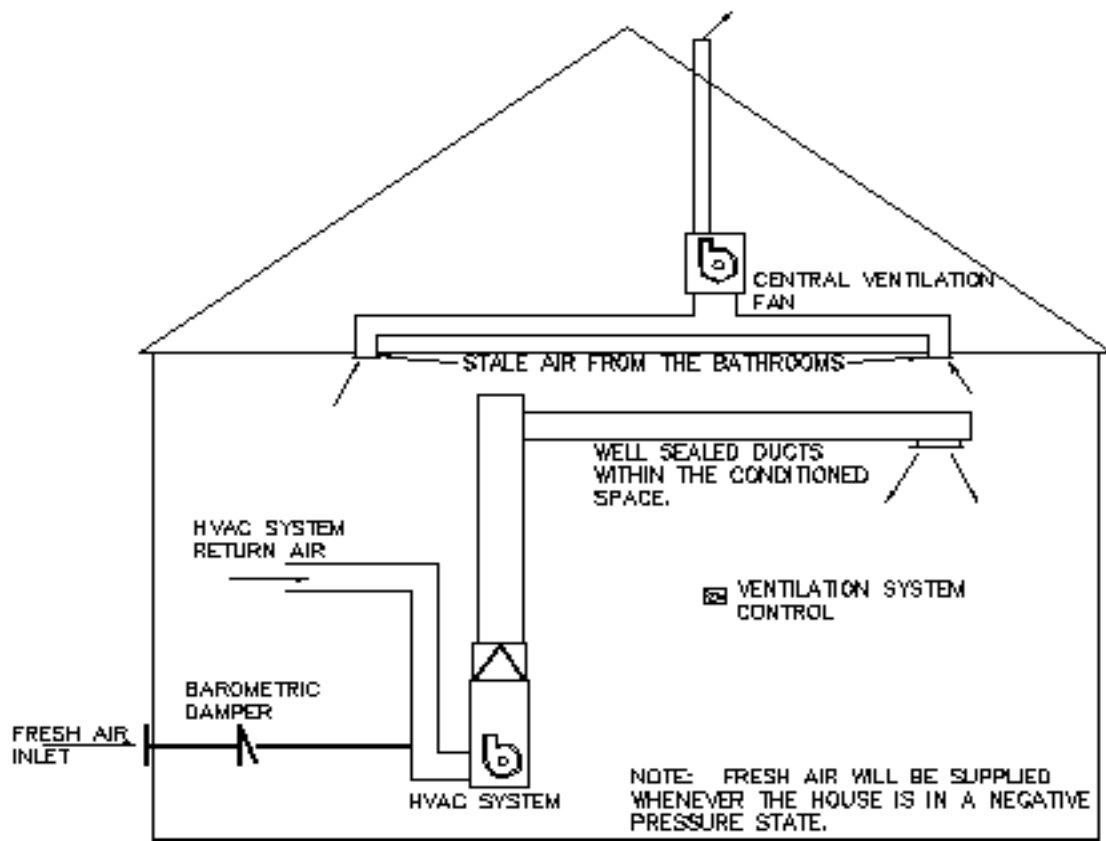
10-10 Piping Requirements. Air conditioner condensate drains, refrigerant suction, and exterior refrigerant liquid lines shall be insulated with 25 mm [1 inch] (minimum) thick cellular glass or unicellular foam pipe insulation. Exterior refrigerant line insulation shall be encased in either an aluminum or PVC jacket to prevent damage. Condensate lines shall be one size larger than the drain pan connection, be properly trapped, and not directly connected to a sanitary sewer system (air gap fitting required).

10-11 Radon Mitigation. Due to moderate level Radon test readings in the area, both passive barriers and sub-slab suction system are required for every housing unit in accordance with TI 810-91. The passive barrier consists of a capillary water barrier and 6 mil polyethylene sheet under floor slab as well as sealing all pipe and conduit penetrations of floor slab. The sub-slab suction system consists of a 100mm (4 inch) diameter perforated PVC piping system located in the capillary water barrier connected to a non-perforated 100 mm PVC pipe stubbed up through the floor slab and capped for future extension to an exhaust fan. See paragraph 14 for additional requirements.

10-12 Active Ventilation Engineered IAQ Enhancement. The bathroom exhausts, within each unit, shall all be ducted together to a common exhaust plenum equipped with a single long-life, low cfm, two-speed fan. The fan shall be sized to provide the required exhaust rate in each bathroom space when operated at low speed. Control for this fan shall be accomplished from a wall mounted switch, located in the linen closet, labeled HI-LOW-OFF. The OFF position of the switch shall illuminate a "RED" LED to indicate the off condition of the ventilation system. The supply ventilation portion of the system shall consist of a small duct providing a connection for fresh (outdoor air) air to the furnace return duct. This duct shall contain a barometrically-controlled vent which shall admit outdoor air to the unit whenever the housing unit is experiencing a negative pressure. ASHRAE 62-1989, "Ventilation for Acceptable Indoor Air Quality" recommends ventilation air supply rate at a minimum of 0.35 air changes per hour (ACH) but not less than 15 cfm per person. This is supplied by either natural infiltration or a combination of natural infiltration plus active ventilation. The fresh air supply duct shall be sized to provide no more than this minimum 0.35 Air Changes per hour maximum ventilation rate (but in no case shall the ventilation air introduced into the unit from the combination of natural infiltration and active ventilation be less than recommended by ASHRAE 62 with consideration for two (2) occupants per bedroom).

This system is a recommended "Energy Star Homes" approach for improving indoor air quality in residential construction. The Active Ventilation Engineered IAQ Enhancement described in this paragraph is considered to be a minimum level compliance item (See Diagram below.) in weather regions 5 through 11. In weather regions 1-4 extreme cold conditions and energy efficiency considerations may require the use of alternate approaches, some including heat recovery ventilators (HRV). Contractors are encouraged to present and propose other systems/methods which are enhancements/improvements to the system described and can ensure adequate fresh ventilation air (0.35 AC/Hr Max) is provided to the interior spaces of the housing units.

Contractors are encouraged to review "Energy Star" materials and information available to them through the EPA and/or by visiting the Energy Star Web page. See, for example, [http://yosemite.epa.gov/appd/eshomes/eshaware.nsf/attachments/lib/\\$file/BalancedVentSys.pdf](http://yosemite.epa.gov/appd/eshomes/eshaware.nsf/attachments/lib/$file/BalancedVentSys.pdf) and [http://yosemite.epa.gov/appd/eshomes/eshaware.nsf/attachments/lib/\\$file/SupplyVent.pdf](http://yosemite.epa.gov/appd/eshomes/eshaware.nsf/attachments/lib/$file/SupplyVent.pdf).



ACTIVE VENTILATION SYSTEM SCHEMATIC

10-13 Testing, Adjusting, and Balancing. Adjusting and balancing of each housing unit shall be the Contractor's responsibility. Following adjusting and balancing, testing of air and water systems shall be performed on 10 percent of the project buildings (not to exceed 10 buildings), which have been randomly selected by the Contracting Officer. If buildings are to be turned over in phases, testing shall be performed on 10 percent of the buildings completed in each phase (not to exceed 10 buildings per phase). No additional testing will be required if at least 90 percent of the tested buildings pass the test requirements. If less than 90 percent of the tested buildings pass the test, an additional 10 percent of the project buildings (not to exceed 10 buildings) shall be tested. This process shall continue until 90 percent of the total number of tested buildings pass. The contractor shall correct all housing units not found in compliance, and shall be responsible for all labor and materials required for this effort. AABC MN-1, NEBB-01, SMACNA-07 or ASHRAE 111 shall be used as the standard for providing testing of air and water systems. The selected standard shall be used throughout the project. Instrumentation accuracy shall be in accordance with the standard selected. Testing shall be accomplished by a firm certified for testing by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been installed and are operating as specified. Where specific systems require special or additional procedures for testing, such procedures shall be in accordance with the standard selected. Approved detail drawings and all other data required for each system and/or component to be tested shall be made available at the job site during the entire testing effort. Testing shall not commence until approved by the Contracting Officer. The facility shall be essentially complete with final ceiling, walls, windows, doors, and partitions in place. Doors and windows surrounding each area to be balanced shall be closed during testing and balancing operations. Air systems, hydronic systems, and exhaust fans shall be complete and operable. All data, including deficiencies encountered and corrective action taken, shall be recorded. Following final acceptance of certified reports by the Contracting Officer, the setting of all HVAC adjustment devices shall be

permanently marked by the Contractor's balancing engineer so that adjustment can be restored if disturbed at any time.

10-14 Duct Tightness Testing Requirements. The installation of the supply and return ductwork within the units is an item of prime concern with respect to the energy efficient operation of the housing unit as a whole. With that consideration in mind, for heating and air conditioning designs which include ductwork outside of the conditioned envelope, the contractor will be required to test the proto-type units and all units which are blower door tested for tightness (see paragraph 7-3.2) to ascertain the leakage levels from the ductwork in accordance with the following requirements. For system designs which place all the ductwork within the conditioned envelope of the structure or systems which utilize evaporative cooling, no ductwork testing will be required.

10-14.1 Duct tightness testing shall ensure that the leakage rate from ductwork (where the ductwork system is not entirely within the conditioned envelop) shall not exceed 0.15 (L/s)/m^2 [0.03 cfm/ft^2]. If the units tested fail to meet this requirement, the ductwork installation shall be examined, corrections made, and the test redone until the installation passes this requirement. No ductwork systems may be installed in other units until the proto-type units ductwork systems have been validated. Several methods to accomplish this testing are acceptable

10-14.1.1 Testing may be done in accordance with ASTM Standard E 1554-94, "Determining External Air Leakage of Air Distribution Systems by Fan Pressurization". This method describes the process and methodology required to accomplish basically a 'blower door subtraction' method of duct tightness testing.

10-14.1.2 Testing may also be accomplished utilizing "Duct Blaster" methodologies and pressurizing the ductwork to 25 Pascal [0.1 inch of water].

10-14.2 The contractor is advised that the EPA may test, or hire a consultant to test randomly selected housing units constructed in this project. These tests will be completed without cost to the contractor, however, the contractor will be required to coordinate access to the selected unit. If accomplished, this testing is not expected to interfere or delay the construction contractor in any manner.

11. ENERGY CONSERVATION.

11-1 Energy conservation techniques shall be considered as they relate to site design, site engineering, unit design, and unit engineering. Techniques which conserve energy, improve livability, and can be justified by life cycle cost analysis as cost effective are encouraged. Integration of energy conservation systems with the housing unit's design (lighting, structure, mechanical systems, and aesthetics) is essential to facilitate livability and maximum energy savings. If an alternative energy generation method is intended for use as the project's primary energy source, documentation shall be submitted to the Contracting Officer, verifying the system's reliability and ability to meet the project's peak demand. The following paragraphs suggest energy conservation techniques which are considered desirable. The listing is not all inclusive, and the techniques suggested may not be cost effective at a given location or site. Additional consideration in the technical evaluation will be given to designs which incorporate valid energy conservation techniques.

11-2 Passive Solar Applications. Passive solar architectural applications shall routinely be considered as a part of all project designs.

11-2.1 Not used

11-2.2 Storage mass. If thermal performance calculations indicate a need for additional mass (beyond that provided by the housing unit structure) substantiating data will be submitted. The storage mass will be well integrated into the housing unit design. The thermal mass surface area in the space must be a minimum of three times the glazing area. Six to nine times the glazing area is recommended to control temperature swings. The surfaces to absorb solar energy must not be more than 10% covered.

11-2.3 Shading. Movable window treatments are required. These shall be metal blinds. Cooling season shading of glazed surfaces on the east, west, and south elevations shall be considered.

11-3 Not used.

11-4 Not used.

11-5 Not used.

11-6 Condenser Heat Recovery. In regions authorized for cooling, consideration shall be given to installation of a heat exchanger to recover condenser heat and desuperheat for use in heating domestic water. A standard, domestic water heater shall be provided in conjunction with this system to provide hot water during the heating season. Heat pump water heaters can be considered in hot climates.

11-7 Not used.

11-8 Systems and techniques which take advantage of rebates and incentives offered by utilities are preferred and shall be stated by the government and local utility districts.

12. CONTRACTOR PREPARED SPECIFICATIONS

12-1 The successful offeror shall prepare a specification for all work included in the scope of work. The specification shall be tailored to this job. Inapplicable materials shall be deleted. Any reference, description, procedure or other matter required to develop a complete, accurate and concise specification shall be provided. The specification shall include but is not limited to:

12-1.1 A description of the technical requirements

12-1.2 Criteria for determining whether the requirements are met

12-1.3 Quality control requirements and procedures

12-2 Specifications for features of the work shall be organized into divisions and sections in accordance with Construction Specifications Institute (CSI), Master List of Titles and Numbers for the Construction Industry, latest edition. See **Section 01016 (AM#4)** DESIGN DOCUMENT REQUIREMENTS for additional requirements.

12-3 Individual specification sections shall be in the format of CSI, Section Format, A Recommended Format for Construction Specification Sections, latest edition. Exceptions are:

12-3.1 Measurement Procedures and Payment Procedures shall only be used in those section(s) where rock excavation is specified. No other sections shall contain these subparagraphs of the paragraph SUMMARY.

12-3.2 Except as otherwise noted in this paragraph, CONTRACTOR PREPARED SPECIFICATIONS, the paragraph SUMMARY shall not be used.

12-3.3 Submittal requirements, submittal procedures, quality control procedures, and construction operations shall be those contained in the attached **(AM#4)** Section 01320, Section 01330, including the submittal register, Section 01451, Section 01500, Section 01560, and Section 01770. These specification sections shall be incorporated into the contractor prepared specification packages without editing and shall be coordinated with all other specification sections prepared by the contractor.

12-3.4 Section 09900, PAINTS AND COATINGS; shall establish a minimum level of quality for paints, stains, and varnishes to be used in this project.

12-4 Not Used.

12-5 Not Used.

12-6 Contractor prepared specifications shall be reviewed by the Contracting Officer or his designated representatives during the design portion of the project. Contractor will incorporate all required changes after resolution of comments and prior to work initiation on the next phase of the project.

13. SUSTAINABLE DESIGN CONSIDERATIONS:

13-1 Sustainable design techniques shall be considered as they relate to site design, site engineering, unit design, and unit engineering. Techniques which conserve energy, improve livability, and can be justified by life cycle cost analysis as cost effective are encouraged. Integration of energy conservation systems with the housing unit's design (lighting, structure, mechanical systems, and aesthetics) is essential to facilitate livability and maximum energy savings. The following paragraphs define the goals and general objectives for inclusion of sustainable design considerations in this project. This information is taken from US Army Corps of Engineers, ETL 1110-3-491. The listing is not all inclusive, and the techniques suggested may not be cost effective at a given location or site. Additional consideration in the technical evaluation will be given to designs which incorporate and identify Sustainable Design techniques included in the proposal.

13-2 Goals and Objectives of Sustainable Design.

13-2.1 The overall USACE goal of Sustainable Design is to be environmentally responsible in the delivery of facilities. The key traditional elements for decision making in the facility delivery process are cost, quality and time. These elements need to be expanded to include the ecological and human health impacts of all decisions.

13-2.2 Each project generates its own set of goals. However, sustainable design goals should apply to all projects. The goals for improving the environmental performance of facilities include: (a) use resources efficiently and minimize raw material resource consumption, including energy, water, land and materials, both during the construction process and throughout the life of the facility, (b) maximize resource reuse, while maintaining financial stewardship, (c) move away from fossil fuels towards renewable energy sources, (d) create a healthy and productive work environment for all who use the facility, (e) build facilities of long-term value, and (f) protect and, where appropriate, restore the natural environment.

13-3 Sustainable Design and Construction of the Built Environment. Design and construction of sustainable buildings should be in accordance with the following concepts:

13-3.1 Site Work and Planning--Environmentally sensitive planning looks beyond the boundary of the project site to evaluate linkages to transportation and infrastructure, ecosystems and wildlife habitat and community identification. Site planning evaluates solar and wind orientation, local microclimate, drainage patterns, utilities and existing site features to develop optimal siting and appropriate low maintenance landscape plant material.

13-3.2 Building Layout and Design--Optimize building size, and maintain an appropriate building scale for the environment and context of the building or a building component. Layout the rooms of a building for energy performance and comfort, and design for standard sizes to minimize material waste. Pay careful attention to the location of exterior windows. Avoid structural over-design and the resultant waste. Design components of the building environment for durability and for waste recycling.

13-3.3 Energy--Building orientation and massing, natural ventilation, day-lighting, shading and other passive strategies, can all lower a building's energy demand and increase the quality of the interior environment and the comfort and productivity of occupants.

13-3.4 Building Materials--Environmentally preferable building materials are durable and low maintenance. Within the parameters of performance, cost, aesthetics and availability, careful selection and specification can limit impacts on the environment and occupant health.

13-3.5 Indoor Air Quality--Indoor air quality is most effectively controlled through close coordination of architecture, interiors and mechanical, plumbing, and electrical design strategies that limit sources of contamination before they enter the building. Construction procedures for IAQ and post-occupancy user guides also contribute to good long-term IAQ.

13-3.6 Water Usage-- Site design strategies that maximize natural filtration of rainwater are desirable. Water conservation is enhanced by the use of low flow plumbing fixtures and water appropriate landscaping.

13-3.7 Recycling and Waste Management--Waste and inefficiency can be limited during construction by sorting and recycling demolition and construction waste, reuse of on-site materials and monitoring of material use and packaging. Accommodating recycling into building design reduces waste while generating revenues.

13-3.8 Building Commissioning, Operations and Management--Effective building commissioning is essential to ensure proper and efficient functioning of systems. Facilities operations benefit from energy and water saving practices, waste reduction and environmentally sensitive maintenance and procurement policies.

14. ENVIRONMENTAL.

14-1 Environmental Assessment. A Final Environmental Assessment (EA) for New Housing Construction, Patch-Chaffee Area, Fort Sam Houston (FSH), Texas, dated December 2000, has been completed for the proposed action of constructing new family housing units adjacent to the Patch-Chaffee area. There is a FINDING OF NO SIGNIFICANT IMPACT (FONSI) for this proposed action. This proposed action is in compliance with the National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190), as amended. These units will replace 70 existing housing units at the Harris Heights community. Demolition of the existing housing units at Harris Heights will be under a separate contract after completion of new housing and relocation of tenants. The other demolition contract will include work tasks such as environmental sampling/survey, environmental abatement, physical structures and utilities demolition, and necessary site restoration.

14-2 Protection Of Historical Properties And Cultural Resources. The proposed site for new housing at Patch-Chaffee is adjacent to the proposed National Historic Landmark District (NHLD). The proposed construction may have the potential to affect the historic landscape of the Patch-Chaffee area. However, the new housing units will be constructed to preserve the FSH historic heritage in accordance with FSH Installation Design Guide (IDG) and Historic Landscape Master Plan. In addition, the Secretary of the Interior's Standards for Historic Preservation will be utilized in developing the design. Therefore, no adverse impact to the historic landscape is expected.

14-3 Protection of Biological Resources. The new housing construction will not result in adverse impacts on flora and fauna because construction would occur in existing residential areas. The few trees and shrubs removed during construction activities will be replaced during landscape planting of these areas. The Historic Landscape Master Plan for FSH has been adopted for the entire installation, and requires xeriscape landscaping for all new re-vegetation efforts. Xeriscaping will primarily utilize drought-tolerant species of grasses, perennials, ground covers, vines, shrubs, and trees. Removal of trees is best accomplished during late summer to early spring (mid-August to beginning of February) in order to avoid destroying bird nests and to be in compliance with the Migratory Bird Treaty Act.

14-4 Land Use and Visual Resources. The existing land use category will need to be revised to a family housing category. Development on vacant lots will result in a slight beneficial impact on land use. The adjacent area will remain residential, and the overall quality and character of the neighborhoods will be enhanced by the replacement of vacant lots with new homes consistent with the existing architectural styles. The land use category will be consistent with the Real Property Management Plan (RPMP) goals and objectives, and especially in reducing the FSH housing deficit.

14-5 Water Resources. The proposed site for new construction is not located within a floodplain or wetland area. Construction in the Patch-Chaffee area, an already disturbed area, is not anticipated to impact surface water resources at FSH. The overall increase in housing units after project completion will not significantly impact aquifer water level because of utilizing water-saving fixtures units, and landscaping with xeriscape methods.

14-6 Utilities: The removal of existing housing units in the Harris Height community will off-set the demand of water, gas, or electricity. In addition, the Water Use Reduction Program will encourage water conservation practice on post. Mechanical designer for new housing will utilize an energy conservation system for heating and cooling. The new housing shall use new, energy efficient building products to reduce electrical powder demand. Therefore, there is no increase in electrical power consumption anticipated due to the proposed action.

14-7 Noise Impact: Noise resulting from construction activity is anticipated to be moderate, short-term, and generated only during regular working hours. Noise level is expected to return to normal levels after completion of construction. Noise level within the Patch-Chaffee area will slightly increase upon occupancy, but will not have significant impact.

14-8 Water Quality and Prevention of Water Pollution.

14-8.1. Water Supply. The pressure, quantity, and quality of the existing water supply system are adequate for the family housing development. New water lines and valves, etc., will be designed and constructed under this contract. See further discussion of the water distribution system in Section 01001 Statement of Work, paragraph 4- SITE ENGINEERING.

14-8.2 Municipal Wastewater. The existing sanitary system is adequate for the family housing development. New sewer lines, manholes, etc., will be designed and constructed under this contract. See further discussion of the sanitary sewer system in Section 01001 Statement of Work, paragraph 4- SITE ENGINEERING.

14-8.3 Industrial Wastewater. No industrial wastewater will be generated during construction.

14-8.4 Protection of Surface and Storm Water. Construction sites that are two (2) ha (or 5 acres) in size or larger are required to have a National Pollutant Discharge Elimination System (NPDES) Storm Water Construction Permit. In accordance with Federal Register, Volume 63, Number 128, July 6, 1998, the Contractor/designer shall prepare a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP narrative and the Erosion and Sediment Control Plans shall be prepared and submitted in accordance with specifications Section 01421 – Basic Storm Water Pollution Prevention Plan.

14-9 Air Quality and Prevention of Air Pollution

14-9.1 The construction of new housing in the Patch-Chaffee area will have an insignificant impact on the air resources of the region. Construction activities will have short-term and minor adverse impacts on air quality by increasing fugitive dust emissions. However, these increases will be temporary and localized.

14-9.2 Burning of debris and waste material at the project site is prohibited.

14-9.3 Dust control practices and other particulate emissions during construction shall be in compliance with the Clean Air Act (CAA) , Texas Clean Air Act (TCAA), and in accordance with specification Section 01561 DUST CONTROL.

14-9.4 The Final Environmental Assessment, dated December 2000, indicated no concern for radon. However, the email message (dated February 2002) from Mr. David Walker (Fort Sam Houston Directorate of Safety, Environment and Fire Compliance Branch), stated some current radon readings on base were above 4 picocuries (pCi/l) and one reading was as high as 13 pCi/l. Since then, a design directive on radon has been requested from the Directorate of Safety, Environmental and Fire Compliance Branch. The design directive is not available during the preparation of this document; therefore, the most current and the highest radon measurement (13 pCi/l) in one existing building in close proximity to the proposed housing units, is used to determine the design requirements for radon prevention in this contract. Based on this reading (13 pCi/l) per TI 810-91, INDOOR RADON PREVENTION AND MITIGATION (dated August 1998), design requirements for radon prevention shall consist of Passive Barriers (Letter Code A) and Sub-slab Suction Systems (Letter Code C) for the proposed family housing units. These requirements shall be incorporated in the mechanical, and structural/foundation design for the proposed family housing units (also reference paragraphs UNIT DESIGN- HEATING, VENTILATING, AND AIR CONDITIONING and UNIT DESIGN- STRUCTURAL in this document). Prior to the preparation of design documents, the Contractor shall verify, with the Directorate of Safety, Environment and Fire Compliance Branch, if 13 pCi/l is still the highest radon measurement in the existing buildings. The Contractor shall use the latest and the highest radon measurement to verify the design requirements (Letter Codes) per TI 810-91 for radon prevention.

14-10 Municipal Solid Waste. The Contractor shall dispose of municipal solid waste and demolition debris off-post at their own expense.

14-11 Regulated Waste. Regulated materials such as asbestos, lead-based paint, or pesticides are not anticipated in the construction of new housing. An environmental survey, sampling, and abatement of

regulated materials is not required in this contract. If removal of utility poles or pole-mounted, wet-type transformers are required, the Contractor shall notify the Contracting Officer's Representative and the Directorate of Safety, Environment, Fire and Compliance Branch.

14-12 Fuel Contaminated Area. The contaminated area is located at the southeast area of the block that is bound on the north by Taylor Road, on the south by Wilson Street, on the west by Road No. S-23, and on the east by an unnamed dirt road which is an extension of 15th Street (south of Wilson St. and intersects Wilson St. and Taylor Road). This block was intended to be a part of the initial proposed family housing project site. The contaminated area is the previous location of a demolished aircraft hangar maintenance shop B/1198. As requested by the Corps of Engineers, CESWF-PER-DD, one composite soil sample was obtained by CESWF-EC-DG at five (5) separate sub-sample locations around the perimeter of the previous hangar footprint. For screening purposes, the composite sample was analyzed for eight (8) RCRA metals, Total Petroleum Hydrocarbon (TPH, Method TNRCC 1005), and Semi-Volatile Compounds (EPA method 8270). The composite soil sample had several fuel constituents as well as metals. The levels of fuel constituents in the composite soil sample cannot be compared to TNRCC Texas Risk Reduction Program (TRRP), 30 TAC 350, regulations because they are not from a discrete sample. The results indicate at least one of the soil sub-samples is contaminated and the previous hangar site has a fuel release but the horizontal and vertical extent of contamination is unknown. In addition, there are four (4) soil borings obtained from this entire block, soil borings locations are different from the sub-sample locations for soil analysis, but no groundwater is detected from ground surface to 13 feet depth. The sites of demolished Buildings No. 1194, 1195, and 1144 are in the same block and north of the previous hangar B/1198. From information provided by the Directorate of Safety, Environment and Fire Compliance Branch, these demolished buildings were administrative offices. Because the extent of contamination is unknown, the Directorate of Safety, Environment, Fire and Compliance Branch is recommended by the Corps of Engineers to pursue reporting of a release, and further environmental investigations to delineate extent of contamination, with guidance from TNRCC through another contract. Therefore, construction work is not recommended in the entire block (see description above) under this contract.

14-13 The Proposed Project Site. The proposed location for the family housing project (excluding the block that contained the previous hangar site, see par. 14-12) is described in paragraph 1-2.3.2. The proposed site is currently unoccupied. Based on the 1985 site plan list, the following structures were demolished: P-1100 Swimming Pool, T-1101 Bath House, T-1119 Enlisted Barracks, T-1123 Drug & Alcohol Abuse Center, T-1126 Laboratory, T-1172 Battalion HQ, T-1173 Facility Engineer Storehouse, T-1174 Warehouse, T-1175 Maintenance Shop, T-1176 Warehouse. The FSH Directorate of Safety, Environment, Fire and Compliance Branch has verified that the proposed project site has no known contamination from previous activities of the demolished facilities, based on the Preliminary Assessment/Site Investigation (PA/SI) study (dated September 1998) under another contract.

14-14 Construction Material for New Housing Units.

14-14.1 Construction material shall not contain any asbestos.

14-14.2 Potable water supply system shall have lead free pipes and joints.

14-14.3 Paint to be used for the new housing units shall have a certificate stating that the paint does not contain more than 0.06 percent lead by weight of the total non-volatile compounds, mercury containing mildewcide, insecticide, and it meets the Federal Volatile Organic Compound (VOC) regulations and state air pollution requirements.

14-14.4 Pesticides, fungicides, or insecticides utilized for foundation treatment or grass fertilization shall be EPA approved. It shall be applied by licensed and certified personnel with licensed equipment and transporter.

14-15 Federal, State, Local Permits and Notifications.

14-15.1 EPA's NPDES Storm Water Construction Permit. This permit is required for storm discharges prior

to construction. All submittals shall be in accordance with Section 01421 Storm Water Pollution Prevention Plan. EPA administers the NPDES Storm Water Construction Permit program for larger than 2.0 hectares (or 5 acres) construction sites until July 3, 2003. Texas Pollutant Discharge Elimination System (TPDES) will administer the Storm Water Construction Permit for construction sites larger than 2.0 hectares (or 5 acres) after July 3, 2003. The Contractor shall evaluate the time frame of the construction activities and determine if the permitting authority has shifted from EPA to Texas Natural Resource Conservation Commission (TNRCC). Section 01421 shall be edited to reflect this change, if necessary

14-15.2 Notice of Intent (NOI). The Contractor shall submit NOI prior to construction. NOI shall be submitted no later than 48 hours before start of construction.

14-15.3 Storm Water Pollution Prevention Inspection and Maintenance Report. The Contractor shall submit Inspection & Maintenance Reports during construction in accordance with Storm Water Construction Permit and Section 01421 Storm Water Pollution Prevention Plan.

14-15.4 Notice of Termination (NOT). NOT shall be submitted upon completion of each construction contract.

14-15.5 The Contractor shall supply a "Customer Service Inspection" certificate for the water supply in accordance with the TNRCC regulations. The completed and signed certificate shall be submitted to the Contracting Officer for review and final approval.

14-15.6 The Contractor shall allow adequate time to obtain digging permit from DPW prior to any digging, drilling or excavation activities.

14-15.7 Per TAC 30, rule 290.39, the plans and specifications of the water distribution and wastewater collection systems prepared by the design and build Contractor shall be reviewed and approved by Texas Natural Resource Conservation Commission (TNRCC) for obtaining a public water system permit. Typically, the review process may require 30 to 60 days.

14-15.8 Backflow preventers shall be certified to operate in accordance with state regulations. Testing of backflow preventers shall be performed by certified personnel. If no State requirement exists, the Contractor shall have the manufacturer's representative test the device to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation, at the time of the final inspection for the facility, stating that the tests have been performed and that the backflow preventers operate properly in accordance with State regulations. The individual performing the tests shall sign this documentation.

SECTION 01015

DESIGN REQUIREMENTS AFTER AWARD
02/2002
AMENDMENTS NO. 0004 and 0005

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Section Includes

This section includes requirements for developing and submitting a design including preparation of drawings, specifications and design analyses conforming to the requirements contained in this section.

1.1.2 Section Excludes

This section does not include requirements for construction submittals which are specified in Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI)

CSI MasterFormat (1995) MasterFormat

CODE OF FEDERAL REGULATIONS (CFR)

40 CFR 763 Asbestos

1.3 DESIGN COMPLETION SCHEDULE

See paragraph COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK in Section 01000 DESIGN AND CONSTRUCTION SCHEDULE for the Completion Schedule of the entire work.

1.4 METRIC REQUIREMENTS (CONTRACTOR'S OPTION)

The Contractor has the option of providing the design in either English or Metric dimensions. Once the dimensional standard (English or Metric) is selected, the Contractor needs to remain consistent in using the same standard for the entire project. The furnished site topographic survey is in metric units. The Contractor is responsible for converting the survey to English units if he elects to use English units. See Section 01016 DESIGN DOCUMENT REQUIREMENTS for additional requirements.

1.4.1 Definitions

Definitions of hard and soft metric are specified in Section 01415 METRIC MEASUREMENTS.

1.4.2 Project Documents

Wherever possible, the project documents shall be accomplished using "hard" metric measurements; drawings, narratives, calculations, dimensions, capacities, and similar expressions of measurement shall be expressed in "hard" metric units.

1.4.3 SI Units of Measure

Products and building components furnished in "hard" metric units are those manufactured using SI units of measure. SI units of measure shall be stated in metric only; do not repeat their English equivalency in parentheses following the metric unit.

1.4.4 Modular Construction Products

Soft metric conversions from their English units are permitted for modular construction products, unless the application of the product requires it to dimensionally coordinate into the 100 millimeter building module. Modular construction products are brick, concrete block, wallboard, plywood, suspended ceiling systems, recessed lighting, raised access flooring and other manufactured components with dimensions based upon a four (4) inch building module. Coordinate finishes available in metric with those available in non-metric.

1.4.5 Metric Design Guide

The designer shall obtain a copy of and follow the requirements in the "Metric Design Guide" (PBS-PQ260), May 1994, U.S. General Services Administration Public Buildings Service. A copy will be furnished after award of the contract.

1.5 DEFINITIONS

1.5.1 Acceptance

This is the Government's review of the design submittals, construction submittals, and record drawings for conformance to the Contract requirements. Acceptance shall not be construed to be an endorsement of the accuracy or completeness of the design. The Contractor is ultimately responsible for the contract design and construction. Design deficiencies or omissions in the accepted design shall be the responsibility of the Contractor and the Designer of Record.

1.5.2 Approve, Approved and Approval

As these words are used throughout the documents, they shall mean "as approved by the Designer of Record unless otherwise expressly stated." See Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES.

1.5.3 Complete Specification Section

A Complete Specification Section is one that follows the Construction Specifications Institute's (CSI) 16-Division, 3-Part Section format, including the required submittal register and testing requirements.

1.5.4 Contractor

Firm or company to whom award is made to design and construct the project.

1.5.5 Contract Documents

Contract Documents, in addition to the signed Contract Form and the Contract Clauses, include the Request for Proposal, all amendments, the Contractor's proposal as accepted at the time of contract award, and the Contractor approved, Government accepted 100% final construction documents..

1.5.6 Construction Documents

Documents provided by the Contractor and accepted by the Government for use in constructing the project, including but not limited to final design drawings and specifications, schedules, submittal registers, and color boards.

1.5.7 Corps of Engineers Guide Specifications (UFGS)

Includes the Corps of Engineers Unified Facilities Guide Specifications (UFGS) for Military Construction, the narrow-scope sections developed by the Fort Worth District (UFSWF GS), and the Fort Worth District Supplements to the UFGS.

1.5.8 Design Documents

Documents which include design drawings, project specifications, and design analyses (basis of design and calculations) prepared by or under the direct supervision of registered professional architects and engineers and proposed by the Contractor to meet the requirements of this Contract.

1.5.9 Design Drawings

Documentation showing in graphic and quantitative form the extent, design, location, relationships, and dimensions of the construction to be provided by the Contractor. (Note: Shop Drawings, as defined in Section 01330, "CONSTRUCTION SUBMITTAL PROCEDURES," are not to be provided until after design drawings are accepted for construction.)

1.5.10 Designer

Architects and Engineers (A/E) associated with the Contractor who are responsible for the design and have the qualifications and experience specified.

1.5.11 Designer of Record

The Contractor's Architect/Engineer (A/E) is the "Designer of Record" and officially approves the design submittals, construction submittals, and record drawings. There shall be a designer of record for each design discipline. The designer of record is solely liable for design errors and/or omissions and shall have professional liability insurance to insure the designer against design errors and omissions. The Contractor's Quality Control Staff will check and certify all submittals. See paragraph DESIGNER(S) OF RECORD for additional requirements.

1.5.12 Mandatory Guides

Mandatory Guides are those **(AM#5) UFGS, UFSWF, or other** guides listed in in the Project Table of Contents as Attachments or included in Divisions 2 through 16 of the Contract as unedited or partially edited guides and which shall be included in the Contractor's construction specifications. Some of the guides may be partially edited while others may not be edited at all. The Contractor shall edit or finish editing these guides.

1.5.13 Mandatory Sections

Mandatory Sections are those **(AM#5) UFGS, UFSWF, or other** sections included in Divisions 2 through 16 of the Contract which have been completely edited and shall be included in the Contractor's construction specifications verbatim.

1.5.14 Solicitation or Request for Proposal (RFP)

Documents furnished to prospective offerors containing proposal information and specifying criteria and project requirements for design and construction of the project. The documents include this specification, attachments, and the information drawings.

1.5.15 Construction Specifications

Construction specifications are the Contractor's developed project specifications consisting of the Government-furnished Division 1 (General Requirements) sections and the Contractor-written sections in Divisions 2 through 16 which will be used to construct the project. Divisions 2 through 16 shall include the Contract **(AM#5) mandatory guides and sections.**

1.5.16 Design Development (60 Percent Preliminary Design) Submittal

Design Development (60 Percent Preliminary Design) Submittal shall mean 60 percent building design and 100 percent site work, utilities (including utilities within the 1.5m [line of the building), and foundation design submittal. See paragraph DESIGN SUBMITTALS for further clarification.

1.6 SUBMISSION OF CONSTRUCTION DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES

1.6.1 Certification

With each submittal the Contractor shall certify that all items submitted in the design documents (after contract award) comply with the Contract requirements. The criteria specified in this Contract are binding contract criteria and in case of any conflict, after award, between the Contract criteria and Contractor's submittals, the criteria stated in the Document Order of Precedence in Section 00800 SPECIAL CONTRACT REQUIREMENTS will govern. The Contractor shall present with the letter of transmittal for each design submittal (including the 100 percent corrected design (compliance check) submittal) a certification that the submittal (drawings, specifications, design analysis, etc.) complies with the requirements stated above. Prepare the design certification and transmittal letter in the format shown on Attachment A attached at the end of this Section.

1.6.1.1 Signatures

The certification shall be signed by an officer of the Contractor's company, authorized to contractually obligated the company, and the licensed architect/engineer designer of record attesting that the drawings,

specifications, and design analyses prepared for the construction of the project meet the requirements of the Contract.

1.6.2 Deviations

Deviations from the Contract requirements shall be identified in each design submittal's letter of transmittal. Deviations from the Contract requirements will be considered for approval by the Contracting Officer. The Contracting Officer may reject any deviation proposed by the Contractor without explanation.

1.6.3 Field Verification

The Contractor shall verify field conditions which are significant to design by field inspection, researching, and reviewing the existing documents pertaining to the site and existing building(s), and evaluating observable existing conditions. The information shall be reflected in the design documents. It is the responsibility of the Contractor to evaluate existing conditions in the immediate proximity of the project to determine if such conditions may affect, or be affected, by the proposed construction. If there are site conditions which appear to affect the proposed construction the Contractor shall inform the Contracting Officer, in writing, before proceeding with the work.

1.6.4 Number of Copies

The number of copies for distribution is specified in paragraph "Review Document Distribution." For each design submittal, submit for review and acceptance the specified number of copies of the construction drawings, specifications, design analyses, equipment schedules, submittal register, and all other submittal data, which shall be in accordance with the requirements of the Contract Documents. Upon final acceptance, make distribution of the accepted design and construction documents within 7 calendar days. With each distribution, provide one CD-ROM disk (or more if required) containing all documents. The CD-ROM disks shall be fixated "Final," which is a recording option that renders the disk totally used so that no other data tracks can be added in a later recording session. Proposed modifications shall be submitted in 8 copies. Final modifications, after negotiations, shall be submitted in 8 copies (including one reproducible).

1.6.5 Final Construction Documents

Each distributed set shall consist of full-size paper drawings, specifications, submittal register, design analysis, and a CD-ROM disk(s) containing all of the final design documents (e.g. drawing, specification, submittal register, and design analysis files). Provide documents complete, accurate, and explicit enough to show compliance with the Contract requirements and to permit construction. Drawings and specifications illustrating systems proposed to meet the requirements of the Contract shall reflect proper detailing for each such system to assure appropriate use, proper fit, compatibility of components and coordination with the specifications and design analysis required by this section. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and specifications. See Section 01016 DESIGN DOCUMENTS REQUIREMENTS for additional requirements. During and upon completion of the project, the accepted design documents shall be corrected to reflect as-built conditions in accordance with Section 01770 CONTRACT CLOSEOUT.

1.6.5.1 Final Construction Drawings

In addition to the required number of hard copies of final design documents (e.g. drawings, specifications, submittal register, and design analysis), final construction (100 percent) drawings and record (i.e. as-built) drawings after the completion of the project shall be submitted on CD-ROM disk in the CADD format required by the Contract. Furnish three CD-ROM disks, one each for the Area Office, Corps of Engineers' District Office, and one for the User. On the CD-ROM disk include the electronic .dgn or .dwg CADD drawing files, the CADD drawing files in .CAL format (CADD files converted to .CAL) for viewing on MaxView Reader, and an Excel spreadsheet listing for each drawing the drawing number, sequence number, level/layer assignments, line colors, line weights, and line types. See Section 01016 DESIGN DOCUMENT REQUIREMENTS for additional requirements.

1.6.6 Computer Aided Design and Drafting (CADD) Systems

Within 10 days of Contract Notice to Proceed, furnish for approval samples of CADD electronic files created on the equipment and software to be used for this work. CADD work will not proceed until the Contractor's proposed CADD system and resulting CADD files have been acceptably demonstrated to work on the Corps of Engineers' Fort Worth District Office and the User's CADD systems.

1.6.7 Specifications and Design Analysis

Specifications and design analysis shall be provided in hard copy and on the same CD-ROM disk as the drawings, in Microsoft Word for Windows format (Version Microsoft Word 97 minimum, but shall be compatible with the version used at Fort Sam Houston). The Division 1 sections included in the Contract shall be reprinted in the final 100 percent construction specifications. Hard copies of the specifications and design analyses shall be bound separately in 3-ring binders. Each set of documents shall have its own Table of Contents. See Section 01016 DESIGN DOCUMENTS REQUIREMENTS for editing and format requirements.

1.7 DESIGN DOCUMENTS

Design documents shall include construction drawings, specifications, submittal register, design analysis, and drafts of DD Form 1354. Detailing and installation of all equipment and materials shall comply with the manufacturers' recommendations. Construction drawings and specifications shall not make reference to RFP requirements. The Contractor, including designers, shall visit the site and make other trips as necessary during the design to accomplish the work. See Section 01016 DESIGN DOCUMENT REQUIREMENTS for additional descriptions.

1.7.1 Drawings

See paragraph SUBMISSION OF CONSTRUCTION DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES, subparagraph "Final Construction Documents."

1.7.2 Specifications

Format shall be the Construction Specification Institute (CSI) 16-Division, 3-Part Section format (**AM#5**) _____. Sections (**AM#5**) _____ shall be numbered in accordance with the CSI section numbering system defined in CSI MasterFormat. No two sections shall have the same section

number. Specifications shall be in sufficient detail to fully describe and demonstrate the quality of materials, the installation and performance of equipment, and the quality of workmanship. Division 1 specifications shall consist of the Division 1 sections included in the Contract. The specifications shall clearly identify the specific products chosen to meet the requirements of the Contract (manufacturers' brand names and model numbers or similar product information). Turfing sections shall indicate planting dates.

1.7.3 Design Analysis

Describe the design of each discipline of work, including all features and the necessary calculations, tables, methods, and sources used in determining equipment and material sizes and capacities. Provide sufficient information to support the design of the various categories such as, but not limited to, architectural, interior design, structural, mechanical, electrical, civil including grading, drainage, paving, environmental, and outside utility services, and Contract included items.

1.7.4 DD Form 1354

The 1354 process consists of a preliminary (draft) DD Form 1354 and a Final DD Form 1354. Prepare a preliminary (draft) of DD Form 1354, TRANSFER AND ACCEPTANCE OF MILITARY REAL PROPERTY, so that Fort Sam Houston can update their real property maintenance records. This draft shall contain as many of the resource code items with cost and quantity data as can be developed from the Contractor's final 100% design documents. Submit it to the Contracting Officer within 30 days of the Government's acceptance of the 100% construction documents. The Government will use this Final DD Form 1354 to develop the interim 1354. The form, a sample of a completed form, and a general list of resource codes with cost and quantity data are included in the ATTACHMENTS. An electronic file of the form, DD1354.frl, for use with Delrina Perform Pro Form Filler, version 16 Jul 1992, or its successor software Form Flow Filler, Version 2.22 (March 5, 1999) is located on the Solicitation and Contract CD-ROM disks.

1.7.5 Consumer Information for Handicapped Requirements

The Contractor shall furnish a report including drawings in accordance with the Uniform Federal Accessibility Standards, paragraph 4.34.4 "Consumer Information" for the modified and adaptable features of each unit type of family housing.

1.8 DESIGN AND CONSTRUCTION PERSONNEL QUALIFICATIONS

1.8.1 Project Manager

The project manager shall have a recognized four-year college degree in architecture, engineering (or related technical fields), or construction management and have at least 5 years experience in managing design and construction projects or 10 years experience in managing construction projects only.

1.8.2 Project Architect

The project architect shall have a recognized four-year or higher college degree in architecture, be professionally licensed, 3 years experience as a lead architect, and have at least 5 years design experience.

1.8.3 Designers

In addition to the Project Architect, provide at least one professional licensed architect or engineer for each of the other design disciplines (landscape architectural, civil, electrical, mechanical, and structural design) with at least 5 years experience in their discipline. Each lead designer shall have a recognized four-year (or higher) college degree in architecture or engineering. The field work, analysis, and design of the cathodic protection system shall be accomplished by or under direct supervision of an engineer licensed in corrosion engineering or a corrosion specialist certified by the National Association of Corrosion Engineers (NACE).

1.8.4 Design Quality Control Manager

Design quality control manager and the alternate manager qualifications are specified in Section 01430 DESIGN QUALITY CONTROL. Design quality control manager shall not be the same person as the construction quality control manager.

1.8.5 Construction Quality Control Manager

Construction quality control manager and assistants qualifications are specified in Section 01451 CONSTRUCTION QUALITY CONTROL. Construction quality control manager shall not be the same person as the design quality control manager.

1.8.6 CADD Personnel

CADD personnel shall be proficient in the preparation of architectural and engineering drawings and the CADD equipment that will be used to create the required drawings and record drawings. The lead CADD person shall have at least 5 years experience on the proposed equipment.

1.8.7 Early Childhood Play Specialist

The early childhood play specialist shall have a recognized four-year college degree in early childhood education (or related technical fields), and have at least 5 years experience in the design of play areas.

1.9 DESIGNER(S) OF RECORD

The Contractor shall identify, for approval, the Designer of Record for each area of work. One Designer of Record may be responsible for more than one area. All areas of design disciplines shall be accounted for by a listed, registered Designer of Record. The Designer(s) of Record shall review, approve, stamp, sign, and date all design and construction drawings under their responsible discipline at each design submittal stage, including modification drawings after start of construction (see Section 00800 SPECIAL CONTRACT REQUIREMENTS, clause "Registration of Designers.")

1.10 CONSTRUCTION MANAGEMENT KEY PERSONNEL

The Contractor's construction management key personnel shall be actively involved during the design process to effectively integrate the design and construction requirements of this Contract. In addition to the typical required construction activities, the Contractor's involvement shall include, but is not limited to, actions such as integrating the design

schedule into the Master Schedule to maximize the effectiveness of fast-tracking design and construction (within the limits allowed in the Contract), ensuring constructability and economy of the design, integrating the material and equipment acquisition programs to meet critical schedules, effectively interfacing the construction QC program with the design QC program, and maintaining and providing the design team with accurate, up-to-date redline and as-built documentation. The Contractor shall require and manage the active involvement of key trade subcontractors in the above activities. The Contractor's Quality Control Staff will check and certify all submittals.

1.11 DESIGN SUBMITTALS

1.11.1 General

The Contractor shall schedule the number and date of the design submittal phases and conferences. Design submittals are required at the 60 percent preliminary design stage, the 100 percent final design stage, and at the corrected final design stage. The number, date, and contents of the design submittal phases shall be reflected in the project schedules. An authorization letter to start work will be provided separately by the Contracting Officer for each phase of the design. See paragraph "Government Design Review and Acceptance" and Section 01016 DESIGN DOCUMENTS REQUIREMENTS for additional requirements.

1.11.2 Design Development (60 Percent Preliminary Design) Submittal

The 60 percent preliminary design submittal includes the 60 percent in-progress building design and the 100 percent complete site work, exterior utilities, and foundation design. These documents shall be packaged and stamped "For Review Only - Design Development (60% Design)". Each sheet of the drawings shall also be stamped except sitework, exterior utilities, and foundation drawings which will be stamped Construction Documents (100% design) submittal. See Section 01016 DESIGN DOCUMENTS REQUIREMENTS for additional requirements.

1.11.3 100 Percent Final Design (Construction Documents) Submittal

The 100 percent final design submittal includes all design and construction documents, ready for start of construction. This includes the complete site, utility, and building design, and shall be stamped "For Review Only - Construction Documents (100% Design)". Each sheet of the drawings shall also be stamped. Contractor shall make final proposal of all materials and finishes at this stage. See Section 01016 DESIGN DOCUMENTS REQUIREMENTS for additional requirements.

1.11.4 Compliance Check Design Submittal

The compliance check design submittal(s) include all construction documents after incorporation of the Government's 100 percent final design review comments. These documents shall be stamped "100% Corrected Design"; and each sheet of the drawings shall also be stamped and signed by the Designer of Record.

1.11.5 Insufficient Design Submittals and Delays

No additional time for completion of the Contract will be granted to the Contractor due to insufficient design submittals. Delays caused by the Contractor in completion of the 60 percent design, 100 percent design, or

the 100 percent corrected design will not be considered as valid reason to delay the entire project within the contract project duration.

1.11.6 Deviations or Betterments

The Contractor shall bring to the Government's attention any deviations or betterments made to the RFP and Contractor's proposal documents. These shall be summarized in letter form with reasons and highlighted or clouded details on the applicable drawings and documents submitted. See Section 00800 SPECIAL CONTRACT REQUIREMENTS for additional requirements concerning betterments.

1.11.7 Review Design Documents

The Contractor shall submit all drawing design documents on blue-line media with "FOR REVIEW" stamped in 12.5 mm (1/2-inch) high letters in the lower right corner in red ink. Specifications and Design Analyses shall be hard copy with "FOR REVIEW" stamped in 12.5 mm (1/2-inch) high letters in the lower right corner in red ink. The Contractor shall submit Contractor-approved documents on black-line media with "APPROVED FOR CONSTRUCTION" similarly stamped.

1.12 DESIGN REVIEWS

Design reviews will be held in the offices of the Fort Worth District's San Antonio Area Office at the Design Development (preliminary 60 percent design), Construction Documents (final 100 percent), and corrected final stages of the final design in accordance with the Contractor's Project Schedule. The Government shall have thirty (30) calendar days review period for each submittal (60 percent design and 100 percent Design) and fourteen (14) calendar days review period for submittal of the Compliance Check Design (corrected final design). Design review conference(s) between the Contractor and the Government may be held after submittal of the 60 percent preliminary and 100 percent final design(s) if the Government determines them necessary. The time for Government review will be calculated from the date of receipt of the design submittals at the Government address to the date the annotated review comments are mailed to the Contractor.

1.12.1 Review Intent

Reviews will be for conformance with the technical requirements of the Contract. If the Contractor disagrees technically with any comment and does not intend to comply with the comment, the Contractor shall clearly outline, with ample justification, the reasons for noncompliance within 5 days after receipt of these comments in order that the comment(s) can be resolved. The Contractor shall furnish disposition of all comments, in writing, with the next scheduled submittal. If the Contractor believes the action required by any comment exceeds the requirements of the Contract, the Contractor shall immediately notify the Contracting Officer in writing and take no action regarding this matter until the matter is resolved.

1.12.2 Late Submittals

If a design submittal is over one (1) day late in accordance with the latest design schedule, the Government review period will be extended 7 days. The review conference will be held the week after the review period. Submittal date revisions shall be in writing at least one week prior to the affected submittal.

1.12.3 Review Document Distribution

For each review, review documents shall be sent, in the quantity indicated, to the addresses listed below. The documents will be in their then present "on-board" design status. All documents must contain an index of contents.

Work shall, however, continue up to the time of the review conference date(s) when 2 copies of then-current design documents will be brought to the issuing office for the conference review. Originals of transmittal letters shall be sent to the Area Engineer, address as shown below, and copies should accompany each mail package. Transmittal letters shall indicate distribution by use of the "ATTN" code shown in the address.

No. of Copies

(6 Review) District Engineer
(2 Final) US Army Engineer District, Fort Worth
ATTN: CESWF-EC-D (Mr. John Oblak)
P.O. Box 17300
Fort Worth, TX 76102-0300

(1 Review) CDR, USAISEC-FDEO
(1 Final) ATTN: AMSEL-IE-DE-IN-CO
1435 Porter St., Suite 200
Fort Detrick, Maryland 21702-5047

(12 Review) Public Works Business Center
(3 Final) Attn: MCCS BPW-E (Ed Dager)
Building 4196
2202 15th St., Ste. 7
Fort Sam Houston, Tx. 78234-5007

(4 Review) U.S. Army Corps of Engineers
(5 Final) Fort Sam Houston Resident Engineer
ATTN: CESWF-AO-S (Armando Solis)
4204 Woodcock, Suite 245
San Antonio, Tx. 78228-1319

1.12.4 Additional Review Time

If for any reason the Government requires more time than that stated for review, then the Contractor will be granted an extension of time equal to the number of calendar days of delay.

1.12.5 Government Design Review and Acceptance

Government personnel will present review comments for discussion and resolution. Copies of comments, annotated by the Designer of Record with comment action agreed on, will be made available to all parties at least 10 calendar days prior to the conference. Review conferences will be scheduled by the Contractor. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Valid comments will be incorporated into the Documents. On receipt of final corrected design documents (with all backcheck comments incorporated) and if acceptable, the Contracting Officer shall notify the Contractor in writing that the documents are accepted and construction may begin. Furnish the final design and construction documents in accordance with paragraph "Review Document Distribution." The Government, however, reserves the right to not

to accept design document submittals if outstanding unincorporated comments are of too great a significance. In this case, every effort shall be made during follow-up action between the Contractor and the Fort Worth District to resolve conflicts and problems such that documents can be accepted. However, if final submittal(s) are incomplete or deficient, requiring correction by the Contractor and resubmittal for review, the cost of rehandling and reviewing will be deducted from payment due the Contractor at the rate of \$500.00 per submittal.

1.13 Final Construction Documents

Within 7 calendar days of Government acceptance of corrected 100 percent final design documents, the Contractor shall mail complete sets, in the quantity indicated, of the accepted design documents to the those listed in paragraph 1.12.3 Review Document Distribution (AM#4). Each set shall consist of full size paper drawings, specifications, and design analysis and CD-ROM disk(s) containing all drawing, specifications, submittal register, and design analysis files). During and upon completion of the project, the accepted design documents shall be corrected to reflect as-built conditions in accordance with Section 01770 CONTRACT CLOSEOUT. After acceptance, changes to the final construction documents shall not be made without the Contracting Officer's knowledge and acceptance.

1.14 COORDINATION

1.14.1 Written Records

The Contractor shall prepare a written record of each design site visit, meeting, or conference, either telephonic or personal, and furnish copies to the Contracting Officer and all parties involved within 5 working days. Include subject, names of participants, outline of discussion, and recommendation or conclusions. Number each written record for the particular project under design in consecutive order.

1.14.2 Design Needs List

Throughout the life of the Contract the Contractor shall furnish the Contracting Officer a biweekly "needs" list for design related items. This list shall itemize in an orderly fashion design data required by the Contractor to advance the design in a timely manner. Each list shall include a sequence number, description of action item, and the name of the individual or agency responsible for satisfying the action item and remarks. Maintain the list on a continuous basis with satisfied action items checked off and new action items added as required. Once a request for information is initiated, that item shall remain on the list until the requested information has been furnished or otherwise resolved. Mail copies of the lists\ to both the Contracting Officer and the agencies tasked with supplying the information.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 ATTACHMENTS

ATTACHMENT A

[Prime Contractor's Letterhead]

Date: _____

Contract No.: _____

[Reviewing Component Address]

Subject: DESIGN CERTIFICATION AND TRANSMITTAL FOR

Project Title: _____

Project Location: _____

Contract No.: _____

Gentlemen,

Enclosed are the following documents which I hereby certify are in compliance with the Contract requirements of the subject construction contract and can be used to commence construction subject to Government acceptance:

1. Project Drawings
2. Project Specifications
3. Design Analysis
 - a. Civil
 - b. Water Supply and Wastewater Collection
 - c. Architectural
 - d. Interior Design
 - e. Structural
 - f. Mechanical
 - g. Fire Detection
 - h. Electrical
 - i. Environmental
 - j. Landscape Architectural
4. Submittal Register

[Typed Name and Signature of the
Officer of the Prime Contractor's company]

5. Deviations

Copy to: [As standard with the Contractor]

[Typed Name and Signature of the
Licensed Architect/Engineer of Record]

-- End of Section --

SECTION 01016

DESIGN DOCUMENT REQUIREMENTS

09/2001

AMENDMENTS NO. 0002 and 0005

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI SP-66 (1994) ACI Detailing Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (2000) Structural Welding Code - Steel

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

ICBO Bldg Code (1997) Uniform Building Code (3 Vol.)

MILITARY HANDBOOKS (MIL HDBK)

MIL HDBK 1008C (10 June 1997) Fire Protection For
Facilities Engineering, Design and
Construction

US ARMY CORPS OF ENGINEERS, SOUTHWESTERN DIVISION (SWD)

SWD-AEIM (October, 2000) Architectural and
Engineering Instructions Manual (SWD-AEIM)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Design Data Checklists; .

Include the Fire Protection, Code Analysis, and Handicapped Checklists (Attachments A, B, and C) at the end of this Section with the Design Analysis and submit with the design submittals. Design Analysis shall include a section discussing Environmental Design, indicating issues and considerations during project programming stage, and design features in the final design.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 DRAWINGS

Prepare, organize, and present drawings in the format specified. Provide drawings complete, accurate, and explicit enough to show compliance with the Contract requirements and to permit construction. The layout of individual sheets and the organization of the assembled set shall follow and communicate a logical sequence. General information shall be presented first, progressing to more detailed information. When assembling details, begin in the upper left-hand corner of the sheet with letters progressing to the right and down. Drawings illustrating systems proposed to meet the requirements of the Contract performance specifications shall reflect proper detailing for each such system to assure appropriate use, proper fit, compatibility of components, and coordination with the design analysis and specifications required by this section. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and specifications. For specific drawing requirements, see paragraphs: DESIGN DEVELOPMENT (60 PERCENT PRELIMINARY DESIGN) REQUIREMENTS and CONSTRUCTION DOCUMENTS (100 PERCENT DESIGN) REQUIREMENTS.

The following subparagraphs cover general drawing requirements and supplement those specified in SWD-AEIM, Chapter VIII DRAWINGS.

3.1.1 CADD Drawings

The Contractor shall ensure that all delivered CADD digital files and data (e.g., base files, reference files, cell/block libraries) are compatible with the Government's target CADD system and operating system, which is Bentley Systems MicroStation, version 7.01, running on Microsoft Windows 95/NT, and adhere to the standards and requirements specified. The term "compatible" means that data is in native digital format i.e. .dgn, and can be accessed directly by the target CADD system without translation, preprocessing, or postprocessing of the digital data files. It is the responsibility of the Contractor to ensure this level of compatibility.

3.1.2 CADD Standards

CADD drawings shall be prepared in accordance with the applicable general and discipline-specific provisions for drawing formats, title blocks, borders, level/layer assignments, line colors, line weights, and line types of the "Tri-Service A/E/C Standards" and the "SWD Architectural and Engineering Instruction Manual (AEIM), Chapter VIII, "Drafting Standards."

The CADD standards for design of this project, including seed/prototype files containing the Government's preset standard settings and electronic reference files containing the Government's standard border/title block sheets, are located at the following Web site:

<http://tsc.wes.army.mil/products/standards/aec/aecstdweb.asp>.

The Contractor shall submit a written request for approval of any deviations from the Government's established CADD standards. No deviations will be permitted unless prior written approval of such deviation has been received from the Government.

3.1.3 Size of CADD Drawings

The Contractor has the option of using either Metric or English units of measure. The Overall Size of CADD drawings shall be SI A1 (841 mm by 594 mm (33.11 by 23.39 inches) (AM#2), at the trim line. Full size drawings shall be submitted for all design submittals. SI Metric or English (AM#2) working units and the District's standard file-naming convention shall be used.

3.1.4 .CAL Files

In addition to copying the electronic CADD drawing files to the Submittals' CD-ROM disk, include the drawings in .cal format so that the drawings may be viewed on screen using MaxView Reader that is located on the Solicitation and Contract CD-ROM disk. Include a "sendable" compiled Project.svd index file, created with MaxView Author, so that the drawings may be viewed by double-clicking on this file. MaxView's web site is <http://www.maxview.com>. Keep the CADD files and the .cal files in separate folders.

3.1.5 Drawing Format

Title block shall include, as a minimum, project title and location, sheet title, and sequence number. For each design submittal, each Contractor-prepared drawing shall bear the printed name and signature of the registered architect or appropriate registered engineer responsible for the work portrayed on that drawing and proposed to meet the Contract requirements. For the final submittal, each Contractor-prepared drawing shall bear the stamp or seal and signature of the registered architect or appropriate registered engineer responsible for the work portrayed on that drawing and proposed to meet the Contract requirements.

3.1.6 Drawings Sequence

Arrange drawings by design discipline in accordance with the SWD-AEIM, Chapter VIII, Appendix A, Plate D1, Standard Arrangement Of Drawings.

3.1.7 Drawings Required

As a minimum, the construction drawings shall consist of the following:

- a. Cover or Title Sheet
- b. Index of Drawings (each technical discipline shall have a separate drawing legend sheet located in front of each respective section), Legend, and Abbreviations
- c. Civil/Site Drawings, including Utility Drawings (Water Supply, Wastewater, Gas, Electrical, Fiber and Communication)
- d. Soil Boring Locations and Logs of Borings
- e. Turfing and Landscaping Drawings
- f. Architectural Drawings
- e. Interior Design Drawings
- f. Structural Drawings

- g. Mechanical Drawings
- h. Fire Protection Drawings
- i. Electrical Drawings (including communications, security and fire alarm)
- j. Lightning Protection
- k. Environmental Drawings
- l. Schedules - e.g. Doors, Windows, Interior Finishes, Equipment

3.1.8 Drawing Scales

Work shall be drawn at the scales listed below. All disciplines should use the same scale for plan sheets. Scale for all drawings and delineation will permit complete legibility. A graphic bar or checkerboard scale will be provided on each sheet near the lower left hand corner of the sheet. Unless specified elsewhere, conventional scale standards are as follows:

	<u>METRIC (SI) (ENGLISH)</u>
Site Plans (Buildings)	No smaller than 1:200 (No smaller than 1-inch = 30 feet)
Floor Plans (Note 1)	1:50 (1/4-inch = 1 foot)
Roof Plans	1:50 (1/4-inch = 1 foot)
Exterior Elevations	1:50 (1/4-inch = 1 foot)
Interior Elevations	1:20 (3/4-inch)
Cross Sections	1:50 (1/4-inch)
Wall Sections (Note 3)	1:20 (3/4-inch = 1 foot)
Stair Details	1:20 (3/4-inch = 1 foot)
Details (Note 2)	1:5 or 1:10 (3 inches or 1 1/2 inches = 1 foot)
Reflected Ceiling Plans	1:500 (1/4-inch = 1 foot)
Interior Toilet Elevations	1:20 (3/4-inch = 1 foot)
Wall Types	1:5 or 1:10 (3 inches or 1 1/2 inches = 1 foot)

Notes:

1. Scale of composite plans shall be as required so that the entire facility is drawn on one sheet without break lines.

2. The details shall be large enough to show all fixtures, accessories, equipment, materials, manner of construction, clearances required for proper maintenance, and complete dimensions. Toilet rooms and Equipment rooms are examples of the kind of spaces which shall be drawn as a Detail Plan. All details containing sheet metal flashing shall be 1:5 (3 inches = 1 foot).

3. May be 1:20 if pertinent details are shown at larger scale.

3.1.9 North Arrows

North arrows shall be oriented the same direction on all plan sheets and by all disciplines, including site and civil drawings. Plan north shall be

"up" or to the left on the drawings. Indicate true north on composite plan drawings.

3.1.10 Legends and Symbols

Standard material symbols used on the drawings shall be provided as a separate legend drawing located just in front of the drawings in the set. Add additional material symbols to the Legend Sheet as needed for the project.

The standard symbols used for amendments (a triangular box) or contract modifications (a type of circular box, see the chapter on Drafting Criteria) shall not be used for any other purpose, and care must be taken to avoid using similar appearing but technically different symbols.

3.1.11 Key Plans

Provide key plans whenever the site or floor plan occupies more than one sheet of drawings. Locate the Key Plans at a uniform location on all site and floor and roof plan sheets to show the interrelationship between the building portions. Orient key plans in the same direction as the floor plan on all plan type drawings of all disciplines. All key plans shall be the same size and same location on the drawings.

3.1.12 Building Composite Plans

When required because of size of the building footprint, provide composite floor plans for the architectural, structural, mechanical, fire protection, life safety, and electrical disciplines. Include match lines for combining individual portions of floor plans. For mechanical plans, provide composite plumbing and heating, air conditioning, and ventilation (HVAC) plans showing plumbing and HVAC systems for each level. For plumbing composite sheets, building outline and pertinent HVAC equipment shall be half-toned with plumbing system at standard lineweight. For HVAC composite sheets, building outline and pertinent plumbing equipment shall be half-toned with HVAC equipment at standard lineweight. Do not provide construction notes on these plans. Include a key plan and room schedule legend on the composite plan sheets.

3.1.13 Schedules

Schedules shall be clear and complete. Furnish as many columns as necessary to present the essential information. Do not use the "Remarks" column as a substitute for an information column. Normally a single item shall be presented on each schedule line. Other scheduling methods as standard with the Architect-Engineer may be used if approved by written authorization from the Contracting Officer.

3.1.14 Notes

Notes may be placed on drawings to reduce the amount of repetitive drafting, provided that clarity is not lost. General notes should be placed at the right-hand edge of the sheet and, if possible, should be located on the first sheet in the set. Notes that pertain to each drawing should be placed on each drawing. Keyed notes are permitted. General notes may be provided on a separate sheet if space does not exist on the Abbreviation and Legend sheets.

3.1.15 Dimensions

Dimensions shall be complete, accurate, and fully coordinated. Use slashes, not arrowheads or dots. Dimensions should be to points easily measurable in the construction, and shall be laid so as not to eliminate refiguring in the field. Dimensions should be tied-in to column lines, etc., to facilitate checking. Plan dimensions for frame construction should be to face of stud (or sheathing) for exterior walls, to one face of stud for interior partitions, and to centerline of openings. For masonry construction, dimensions shall be to one or both nominal faces of masonry and to jambs of openings.

a. Horizontal dimensions shall occur on the plans and vertical dimensions on sections and elevations.

3.1.16 Standard Drawings

Standard Drawings, when furnished for site adaptation, will generally be utilized without basic architectural change. Portions of the drawings not pertinent to the project will be deleted. Specific instructions will be given when design changes are required.

3.1.17 Sketches

All sketches presented during the design phase shall be reduced to 216 mm by 280 mm (8-1/2" by 11") and included in the design analysis to document the design options and decisions evaluated during the design process.

3.2 CONSTRUCTION SPECIFICATIONS

3.2.1 Editing Construction Specifications

The Contractor shall use commercially available guide specifications for developing construction specifications, such as "SpecText" published by The Construction Specifications Institute (<http://csi.worldweb.net/technic/master/spectextms.htm>), and "MasterSpec" published by The American Institute of Architects (<http://www.arconnet.com/>), or BSD SpecLink (Building Systems Design, Inc., Atlanta, GA, <http://csi.worldweb.net/technic/master/bsdms.htm> and http://www.bsdsoftlink.com/speclink/sl_frame.htm). Specification paragraphs and subparagraphs shall not be rewritten to lessen the quality of the original guide specification sections. Only bracketed choices and inapplicable items may be deleted unless the changes are required to bring the specification into conformance with the performance specifications of the Contract. The Contractor shall complete the editing of all options in these specifications. Where designer notes are provided, the Contractor shall edit the choice in accordance with the recommendations and guidance of the Notes. **The specifications shall clearly identify, where appropriate, the specific products chosen to meet the requirements of the Contract (manufacturers' brand names and model numbers or similar product information). The Contractor shall be responsible for coordinating references, along with the Contract performance requirements, to specific specification sections (number and title) within the construction specifications.** See additional requirements in paragraphs DESIGN DEVELOPMENT (60 PERCENT DESIGN REQUIREMENTS) and CONSTRUCTION DRAWINGS (100 PERCENT DESIGN) REQUIREMENTS of this Section and in Section 01015 DESIGN REQUIREMENTS AFTER AWARD, paragraph DESIGN DOCUMENTS.

3.2.1.1 Required Modifications to Commercial Guide Specifications

- a. Indicate the guide specification series (e.g. CSI SpecText, MasterSpec, SpecLink) in either the header or footer of each section.
- b. Change references to the "Architect" or "Engineer" to "Contracting Officer" and "Owner" to "Government".
- c. Change references to "Section 01300" or "Section 01300 SUBMITTALS" to "Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES."

3.2.1.2 Additions

If the Construction Specifications do not cover a feature that is in the project, insert additional requirements in their proper locations to adequately cover the feature of work. Additions shall not lessen the quality of materials indicated by the specifications. If a new material is added, it shall be properly referenced in "REFERENCES," "MANUFACTURERS," "MANUFACTURED UNITS," "MATERIALS," "SUBMITTALS," "TESTS," and "INSTALLATION" paragraphs, as applicable.

3.2.1.3 Deletion of Inapplicable Text Material

Delete all inapplicable text material to tailor the specifications to fit the project. After deletion has been made of all inapplicable paragraphs, subparagraphs, choices, and schedules from the body of the guide specifications (including but not limited to the correction of lists in "SUBMITTALS," "TESTS," and "INSTALLATION" paragraphs), delete all nonapplicable references listed in the preceding "REFERENCES" and "MATERIALS" paragraphs.

3.2.1.4 References to Specification Sections

The Contractor shall be responsible for coordinating references, along with the Contract requirements, to specific specification sections (number and title) within the project specifications. Revise section references (title and number) to reflect the titles and numbers of specification sections used.

3.2.1.5 Construction Submittals

The Contractor is responsible for all submittals. See Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES for the definition of Government Approved and For Information Only (FIO) submittals. All submittals shall be "FIO" unless otherwise specified. Submittals noted in the UFGS guides as "G" shall be changed to "For Information Only".

3.2.2 Division 1 Sections

Include Division 1 specifications sections contained in this Contract as part of the project specifications without change.

3.2.3 Format For Construction Specifications

Submit the construction specifications, including cover page and project table of contents, printed with a word processor.

The Lighting Fixture Standard Drawing 40-06-04 Details, and Design Criteria (e.g. Army Technical Manuals (TM's), Engineering Manuals, Engineering Technical Letters, Engineer Circulars, Engineer Pamphlets, Design Guides, and Military Handbooks) can be downloaded from the Internet at the

following address:

[http://www.hnd.usace.army.mil/Techinfo/Engineer Publications or Support Documents](http://www.hnd.usace.army.mil/Techinfo/Engineer%20Publications%20or%20Support%20Documents)

The guides can only be downloaded in Winzip *.zip files. These are downloadable executable files.

Specsintact software, the UFGS guide specifications, and design criteria manuals can also be obtained from the current version of the Construction Criteria Base CD, issued by the National Institute of Building Sciences, telephone number 202/289-7800, fax number 202-289-1092, internet address is:

<http://www.nibs.org>.

Fort Worth District guide specifications and the District supplements to the UFGS guide specifications are located on the Internet at the following address:

<http://www.swf.usace.army.mil/links/e&c/ec-a/>

Print hard copies using laser printer and good quality white paper. For the design submittals, editing of the Construction Specifications shall be shown by using redlining (underlined text) for text insertions and strikeouts for text deletions. The corrected 100 percent specifications with review comments incorporated shall be cleaned up (markings for insertion and deletions removed) and submitted in both hard copy and on CD-ROM disk. Carbon copies are not acceptable.

3.2.3.1 Format

Format shall be the Construction Specification Institute (CSI) 16-Division, 3-Part Section **(AM#5)** _____. Sections **(AM#5)** _____ shall be numbered in accordance with CSI MasterFormat. No two sections shall have the same section number.

3.2.4.2 Cover Page

The Cover page shall be similar to the Contract Cover page and shall include:

- a. Project title, activity and location
- b. Construction contract number
- c. Construction Contractor's name and address
- d. Design firm's name and address
- e. Names of design team members responsible for each Contractor prepared technical discipline of the project specification
- f. Name and signature of a Principal of the design firm

g. The Table of Contents shall list the 16 Divisions contained in CSI format and the specification section numbers and titles contained in the project specification. Do not list in the Table of Contents CSI Divisions that are not required for the project.

3.2.4 Construction Submittals

All construction submittals shall be in accordance with Section 01330, "CONSTRUCTION SUBMITTAL PROCEDURES."

3.2.5 Submittal Register

An electronic version of the ENG Form 4288 is located on the Solicitation and Contract Award CD-ROM disks in folder "Subreg." This version is the Specsintact DOS Submittal Register program and includes a Readme.txt file. Copy the files to the computer's C:\ drive, remove the read-only attributes, and then double-click on either file "subreg.exe" or on "submit.bat." This is **not** a Windows-based program so the mouse **does not** work. Editing instructions are on-screen, such as press the "F5 (add)" and then the "E" keys to create new empty submittals, the "PgDn" key to complete editing, and the "A" key to accept. For each submittal, fill in the Section Number, Activity Number if applicable, Paragraph Number, Description, Type of Submittal (e.g. SD-01 through SD-11(See Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES)), Classification (e.g. G or FIO), and the Contractor's proposed submittal date. Fill in columns "a" through "o" on the ENG Form 4288 and submit a copy of the "Subreg" folder with the updated files and a hard copy of the register as required for the various design submittals. Unless Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES allows a submittal to be Government approved ("G"), all submittals shall be "FIO" for Information Only (Contractor Approved) items. A blank MS Excel version of the Form 4288 Submittal Register is also included in the "Subreg" folder and may be used if allowed by the Contracting Officer.

3.3 DESIGN ANALYSES

Prepare design analyses (basis of design and calculations) for each design discipline. Specific requirements relative to the technical content to be provided are specified in the paragraphs DESIGN DEVELOPMENT (60 PERCENT PRELIMINARY DESIGN) REQUIREMENTS and CONSTRUCTION DRAWINGS (100 PERCENT DESIGN) REQUIREMENTS. The design analyses shall be a presentation of facts to demonstrate that the concept of the project is fully understood and that the design is based on sound engineering. The design analysis for each discipline shall be in accordance with Chapter IX of the SWD-AEIM.

3.4 COMMON DESIGN DEFICIENCIES

The work involved in making corrections due to common deficiencies becomes lost effort and time for both the designer and the reviewer. Carefully compare the design and contract documents with all requirements at several points in the design process to avoid unnecessary changes at a later date. Some of the requirements which are most often overlooked include:

a. Requirements of the COE 2, Southwestern Division's ARCHITECTURAL AND ENGINEERING INSTRUCTIONS MANUAL (SWD-AEIM) have been repeatedly overlooked in the past.

b. Not used.

- c. Not using correct abbreviations or terminology on the drawings. Abbreviations must match what is used on the standard abbreviation sheet and terminology must match what is used in the standard technical guide specifications.
- d. Not using the correct scales, north arrow designation, section cut system, or incomplete dimensioning on the drawings.
- e. Not providing sufficient space for door operation hardware at doors which swing into a wall running perpendicular to the opening. 100 mm minimum is required between edge of door frame and perpendicular walls.
- f. Not providing correct and complete Design Analysis information written in the present tense. The Design Analysis will be written following the format indicated herein. A separate Fire Protection section in the Design Analysis with input from all disciplines is one area which is often overlooked and shall be included.
- g. Not correctly presenting or coordinating (to avoid interference) features of Fire Protection, Noise Control, and Physical Security.
- h. Not correctly referencing and cross referencing building sections, wall sections, details, etc.
- i. Failure to read and use technical notes in editing the Guide Specifications.
- j. Failure to coordinate all disciplines prior to submittal of projects for review.
- k. Improper use of fire-retardant wood. Fire-retardant wood is combustible; its use in buildings that are of noncombustible construction is extremely limited (see UBC for the minor allowable uses). Because of the potential for severe degradation, fire retardant plywood shall not be used in a roof or roofing system, or in structural applications.
- l. Incorrectly listing trade names in door hardware specifications in lieu of ANSI numbers and failure to correctly specify hardware finishes.
- m. Control joints in CMU walls and brick expansion joints in face brick are not shown on both architectural plans, elevations and structural plans, or are inconsistent. Note also control joint locating and coordination for floor tile per Tile Council of America recommendations.
- n. Failure to delete all publications which do not apply to the particular project.
- o. North is not oriented the same direction on all sheets (civil, site, arch).

3.5 DESIGN CERTIFICATION

The Contractor shall provide certification for each design submittal in accordance with paragraph SUBMISSION OF CONSTRUCTION DRAWINGS, SPECIFICATIONS AND DESIGN ANALYSES, subparagraph "Certifications," of Section 01015 DESIGN REQUIREMENTS AFTER AWARD.

3.6 DESIGN DEVELOPMENT (60 PERCENT PRELIMINARY DESIGN) REQUIREMENTS

Preliminary design documents shall include all applicable plans, details, and specifications specified in the paragraph DESIGN DETAILS, drawn to 60 percent completion or more, unless otherwise indicated. The documents shall include all design and items required to be 100 percent complete. Identify and resolve conflicts in the design requirements, between the design requirements and the Contractor's design proposal, or those due to lack of thorough understanding of the nature and scope of work prior to submittal of the 60 percent design. Drawings, design analysis, and specifications will be reviewed for compliance with the Contract design requirements at this design submittal. Submit the following:

3.6.1 Rendering

The Contractor shall prepare an architectural rendering for inclusion with the 60 percent Design Submittal. The rendering will be in full color, represent the final exterior color and material selections, approximately 500 mm by 600 mm in size, on illustration board, matted and framed with non-glare glass, and with project title on mat. The perspective shall be from an eye-level or low-level aerial point of view that will highlight the most attractive features of the project. The Contractor shall furnish one preliminary black-and-white sketch of the proposed rendering to the Contracting Officer, along with three (3) proposed exterior color schemes, for review and acceptance prior to proceeding with the color version.

3.6.2 Drawings

Furnish all drawings that are required for the 100 percent submittal. Except for site work, outside utilities, and building foundation drawings, all drawings shall be developed to approximately 60 percent completion. Site work, outside utilities, and building foundation drawings shall be 100 percent complete. The drawings shall be fully coordinated with the design analysis and specifications.

3.6.3 Specifications

Provide all specification sections required for 100 percent submittal. Specifications for site work, and utilities, and foundation (Division 2 and those applicable in the other Divisions) shall be 100 percent complete. All other specifications required for the completion of the building, turfing, and landscaping shall be at least mark-ups of the required technical and trade sections. Include the identification of the "author" of the industry guide specifications used, any mandatory guide specifications required in this Contract, and a project table of contents listing all sections to be included in the project.

3.6.4 Submittal Register

Prepare a Submittal Register as specified in Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES and paragraph CONSTRUCTION SPECIFICATIONS, subparagraph "Submittal Register," of this Section. Submittals for site work, utilities, and building structure shall be 100 percent complete. Submittals for all other work shall be developed to the extent required to support the level of design included in this submittal. Submit a copy of the "Subreg" folder with the updated files and program and four hard copies of the register with this design submittal.

3.6.4 Design Analysis

The design analysis shall give the basis for design for all disciplines and should establish specific goals, objectives, and priorities for the design of this project. Identify, explain, and document use of design criteria and how the design meets goals, objectives, and priorities. The design analysis shall comply with SWD-AEIM, Chapter IX, and include narrative description and analysis of all building systems, appropriate checklists, calculations, and catalog cut sheets of equipment used in the design.

3.6.5 deleted (AM#2)

3.6.6 Civil Design

The drawings shall be 100 percent complete, ready for start of construction. Drawings shall fully describe the type and the scope of work required. Include all necessary and required details, be thoroughly checked, and be fully coordinated with the Construction Specifications and all other Construction Documents.

3.6.7 Landscaping Design

Provide Landscaping Plan, and any details required for this level of design.

3.6.8 Architectural Design

60 percent architectural drawing submittal shall be a complete set of architectural drawings without large scale details. All other drawings shall be complete except referencing of the large scale details. Room finish schedule, and door, window, and louver schedules, shall all be complete except for references to details.

3.6.9 Interior Design

Provide SID Notebook(s) and design analysis.

3.6.10 Structural Design

Provide details and notes for required structural work. Building structural members shall be at least outlined. Provide elevation views, sections, and details necessary to illustrate the design at a 60 percent level of completion. Roof framing plan(s) shall show sufficient details to clearly indicate the type of framing system used, size, and spacing of members and their elevations.

3.6.11 Mechanical Design

Provide plans, piping diagrams, sections, flow diagrams, details, schedules, and control diagrams/sequences as necessary to define the required design intent at this level of design. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned.

Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:500 (1/4-inch = 1'-0") scale and shall show room names and numbers. Provide preliminary mechanical room sections to ensure that major equipment items, piping, and ductwork will fit as designed. For the 60 percent submittal, all supply and return mains shall be shown as double-lined although branch ducts, takeoffs, and ductwork to diffusers may be single-lined. Piping 6 inches and larger shall be shown as double-lined for the 60 percent submittals.

Complete Attachment C for mechanical room sizing.

3.6.12 Electrical Design

Fully coordinate the 60 percent design drawings with the design analysis. Provide sufficient plans, single-line diagrams, riser diagrams, details, and schedules as necessary to define the required design intent for this level of design. Indicate all circuits, circuit breakers or fuse locations, panelboards, and PDUs known at this level of design.

3.6.13 Fire Protection Design

Provide the Life Safety Plan complete. Fire protection details shall be sufficient for this level of design.

3.6.14 Environmental Design

Provide drafts of the following items for the Preliminary(60 percent design) submittal:

- a. Environmental Survey Sampling Plan (if applicable)
- b. Stormwater Pollution Prevention Plan (SWPPP)
- c. Plans for SWPPP shall include Erosion and Sediment Control Plans, Erosion and Sediment Control Structures and Details, Project Location and Vicinity Map as a separate and stand-alone drawing set.
- d. Design Analysis provides for the preliminary design and final design submittal. It shall address environmental issue and considerations for the project during programming stage and design features. Discussion shall at least include the following:

1.0 APPLICABLE REFERENCES

2.0 CULTURAL AND NATURAL RESOURCES

- 2.1 National Environmental Policy Act Compliance Document (Include Type of document and completion date)
- 2.2 Protection of Historic Properties & Guidance
- 2.3 Protection of Cultural Properties & Guidance
- 2.4 Protection of Threatened and Endangered Species and Critical Habitats & Guidance
- 2.5 Wetland and Floodplains & Guidance

3.0 WATER QUALITY AND PREVENTION OF WATER POLLUTION

- 3.1 Water Supply & Guidance
- 3.2 Municipal Wastewater & Guidance
- 3.3 Industrial Wastewater & Guidance
- 3.4 Storm Water & Guidance (design & construction to prepare and Reference Section (AM#2) 01421 Outline of Storm Water Pollution Prevention Plan)

4.0 AIR QUALITY AND PREVENTION OF AIR POLLUTION

Design Issues & Guidance (Design Features & construction document to be prepared, indoor radon reduction and mitigation design requirements)

5.0 SOLID WASTE

- 5.1 Design Issues & Guidance

6.0 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE (HTRW) (one sub-paragraph for each issue & construction document to be prepared)

7.0 FEDERAL, STATE AND LOCAL PERMITS, LICENSES, NOTIFICATIONS, PRE-CONSTRUCTION PERMITS AND REGISTRATION (reference 01355 ENVIRONMENTAL PROTECTION, and indicate coordination with Base Directorate of Environment (AM#2))

3.7 CONSTRUCTION DOCUMENTS (100 PERCENT DESIGN) REQUIREMENTS

All documents shall be 100 percent complete, ready for start of construction.

3.7.1 Drawings

The drawings shall be complete, ready for start of construction, and include all necessary and required details, be thoroughly checked, and fully coordinated with the construction specifications and all other Construction Documents. The final drawings shall include all the requirements and drawings defined for the 60 percent submittal plus any additional detail drawings required for complete 100% design.

(AM#2). Plans shall be legible at full-size. Previous comments and applicable criteria changes shall have been incorporated into the design.

3.7.2 Submittal Register

Prepare a complete a Submittal Register using ENG Form 4288 "Submittal Register" as specified in Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES and paragraph CONSTRUCTION SPECIFICATIONS, subparagraph "Submittal Register," of this Section, listing submittals for all specification sections that require submittals. Submit four hard copies and on a CD-ROM disk the updated submittal register files and program for this design submittal and the final submittal.

3.7.3 Specifications

The construction specifications shall be complete, ready for start of construction, fully coordinated with the drawings and design analysis, and include all work. Specifications shall be in final form for construction and include all changes requested during the 60 percent review stage.

3.7.4 Design Analysis

The Design Analysis shall include the basic information presented in the previous submittal, corrected to reflect changes in content made in response to review comments. Outline specifications shall be omitted from the Final Design Analysis as the information is included on the final drawings and construction specifications. The design analysis shall be written in the present tense and will comply with SWD-AEIM, Chapter IX.

3.7.5 deleted (AM#2)

3.7.6 Interior Design

Update the drawings, building related interior design (SID), and the SID Notebooks as required as a result of the 60 percent review.

3.7.7 Mechanical Design

All ductwork shall be double-lined. Piping 6 inches and larger shall be shown as double-lined.

3.8 DESIGN DETAILS

Drawings shall include the applicable plans, details, and requirements specified in the SWD-AEIM and those specified below.

3.8.1 Demolition

Show new work and demolition work on separate drawings. The type and the scope of removal work intended shall be clear from an inspection of the documents. Keyed notes for removal will be allowed.

a. Site Demolition Drawings (Removal Plan)

The removal plan shall show the existing physical features and condition of the site before construction. Include the field survey to show all above and below ground utilities; buildings, drives, roads and parking areas, walks, and vegetation; and such facilities as retaining walls, underground storage tanks, foundations, and existing contours. Physical features shall be indicated and noted: to be removed, to remain, or to be relocated.

3.8.2 Civil Design

The drawings shall be complete, fully describing the type and the scope of work required. Include all necessary and required details, thoroughly checked, and fully coordinated with the Construction Specifications and all other Construction Documents. Include the following as applicable:

- Cover Sheet and index of drawings
- Location and vicinity map including haul routes
- Site plan and details
- Grading and drainage plan
- Utility plan with profiles and details
- Pavement plan and details
- Soils boring logs
- Landscaping plans and details

a. Location Plan and Vicinity Map

A Vicinity Map consists of a small scale drawing of the project location, similar to a road map. A Location Plan consists of a small scale drawing showing the Government property or reservation limit with the construction project site shown. Show the Contracting Officer-approved Contractor access and haul routes, load limits on bridges along haul routes, and the designated waste and/or borrow areas. Upon request, a reproducible base sheet will be provided by the Fort Worth District for the Contractor's use in preparing the Location Plan.

b. Site Plan

Show all the site layout information necessary to field locate the building, walks, parking lots, and all other appurtenances to be constructed for the project. All site related work to be constructed will be located by dimensions. Identify all site related items such as curbs,

pavements, walks, courtyards, bollards, trash enclosures, and retaining walls. Unless otherwise specified, site plans shall be at a scale of 1:400, 1:500, or 1:600 (1" = 20' or 1" = 30'). Existing or proposed contours shall not be shown on this Plan. The Site Plan, prior to adding the dimensions, shall serve as the base sheet to the other Plans, such as the Utilities Plan, Grading and Drainage Plans and the Landscape Plan. The Site Plan will show all existing physical features and utilities within and adjacent to the work site that will remain after the proposed construction has been completed. Include free zones, construction limits, storage areas, etc.

Show the building orientation and horizontal dimensional relationships to streets, walks, property lines, easements, fences, and other structures. Space between structures will provide open areas in accordance with good land-use planning and due consideration of future development plans. Maintain fire clearance separations for access for equipment acceptable to the installation (i.e. Installation Fire Chief). Show geometric features of all roads, streets, sidewalks and parking areas. Provide details of all site features.

c. Grading and Drainage Plan

Provide a preliminary grading and drainage plan at a scale of 1:400, 1:500, or 1:600 (1" = 20' or 1" = 30') unless otherwise specified. Indicate new and existing grading contours at 300 mm (1-foot) contour intervals. Provide spot elevations in sufficient numbers so that interpolation between contours is not required. Some examples are: corners of paved areas and parking lots, low points, high points, flow lines of ditches and swales, changes in degree of slope and grading at building corners to insure positive drainage from the facility.

Indicate finished floor elevation of new building(s). Finished floor elevations shall be a minimum of 300 mm (12 inches) above the highest point of the outside finished grade and slope away from the building. Grade contours shall be at 240 mm intervals and spot elevations shall be provided at all site development features.

Show layout of the new and existing storm drainage systems, if applicable, including existing and new storm drainage flows, ditches, swales and piped systems.

Provide the appropriate top of structure elevations and pipe invert elevations of both the new and existing drainage system.

d. Erosion Control Plans

Erosion control plans shall show locations of all sediment basins, diversion ditches, areas to receive rock blanket, and other erosion control structures, indicating the approximate drainage areas each will serve. Indicate the materials, construction, and capacity of each structure.

e. Composite Utilities Plan With Profiles And Details

If required, provide a Composite Utilities Plan at a scale of 1:400, 1:500, or 1:600 (1" = 20' or 1" = 30'). Indicate locations of new and existing utilities. Plans shall show layout of the new and existing storm drainage, gas, sanitary sewer, fire protection, electrical, communication, water, steam, and any other utility systems which need to be provided for. Include new and existing contours. Show mains and distribution lines as

well as all appurtenances such as meters, manholes, and valves.

f. Grading Sections

Grading sections through the new building showing finished and existing grades may be provided to supplement the required grading plan.

g. Pavement Plan and Details

Provide pavement plans for all parking lots, roads, equipment pads and sidewalks. Include cross sections of all paving designs and include details of curbs, gutters, pads, sidewalks, stairs, inlets and other features.

h. Soils Boring Logs

Provide logs of soil borings provided by the geotechnical engineer.

3.8.3 Landscaping

Provide a Landscape Plan showing trees, shrubs, ground covers, seeded and sodded areas. The Landscape Plan shall be prepared by a Licensed Landscape Architect. The landscape plan shall be in accordance with the Installation Design Guide and Fort Sam Houston Landscape Master Plan.. Select and specify types of plant materials that are locally grown, commercially available, and acclimated to the project environment. Include a plant materials schedule or listing which lists the botanical names, common names, key, size, and the method of transplanting for each landscape element. The landscape plan shall also show all unsurfaced ground areas disturbed by construction within the project limits with these areas shown to be seeded, sodded, or mulched as required. Include designs and details for required site furnishings and accessories.

The Contractor shall provide designs and details as necessary for required site furnishings and accessories.

3.8.4 Architectural Design

a. Floor Plans

Provide double line floor plan(s) of the entire building(s), drawn at the largest scale practicable to include the entire building or floor level on a single sheet. The building footprint may be of a size that will require the floor plans to be divided into multiple areas. Floor plans shall be scaled double-line drawings showing the functional arrangement, structural column or bay indicators, material patterns, location of all openings and plumbing fixtures. Section cuts, wall types, notes and leaders, general notes, and dimensions shall be complete. The plans shall indicate room numbers and titles, door swings, door and window numbers and types. Provide door, window, louver, and other schedules as required. Show a north arrow on each floor plan. Include enlarged toilet room and stair plans. The first floor plan sheet shall include a gross area tabulation comparing the actual square footage with the authorized square footage of the facility. Fully justify architect-engineer suggestions for plan improvement. Include:

Overall, Control, Opening, and complete dimensioning
Room Names and Numbers
Wall and Building section cuts

Door Swings and Numbers
Window Types
Square Footage
General Notes

Where major structural elements are included as parts of architectural detailing, do not indicate sizes. Define these elements as part of the structural design documents. Major elements of mechanical and electrical equipment affecting space allocation shall be shown on the architectural plan to the extent practicable and coordinated with other respective disciplines. When applicable, Government-furnished and Contractor-installed, or Government-furnished and installed, items shall be shown as dashed lines.

b. Reflected Ceiling Plans

Reflected ceiling plans shall include all notes, complete legends and pocheing patterns of materials to be used. Provide reflected Ceiling Plans for all spaces in the building(s). Reflected ceiling plans shall show the ceiling tile layout and location of gypsum wallboard and other ceiling types where applicable. Show all light fixtures, air diffusers, grilles, registers, exit lights, public address speakers, fire alarm strobe lights, sprinkler head layout, ceiling mounted equipment access panels or removable ceiling tile and grid elements, smoke and heat detectors, wall fire ratings, ceiling mounted equipment removal pathways, ceiling mounted television mounts, and other ceiling mounted items. The fixtures and other equipment shall be laid out in a regular pattern symmetrical with the ceiling tile grid, or symmetrical with the room centerlines, columns, windows, or other feature that dominates. All ceiling mounted items shown shall be fully coordinated with all other disciplines.

c. Roof Plan

Roof plan shall be complete showing slopes, locations for roof and overflow drains, equipment, and walkways. Coordinate elements located on the roof with all disciplines.

d. Building Elevations

Provide all building elevations complete showing the appearance and architectural treatment. Elevations shall be dimensioned to show story height, total height and relation to grade. Indicate critical elevations such as top of finish floor and top of steel.

e. Building Sections

Include building cross section and longitudinal sections to show general interior volumes, framing method, relationship to adjacent structures, and height of ceilings and partitions. Identify materials used and necessary dimensions.

f. Wall Sections

Drawings shall include all wall section [and stair section] conditions [including enclosed corridor(s) showing vertical control elevations] and dimensions. Label all materials. Cut sections should through doors, windows, and other critical wall section locations. Wall sections shall not be broken. Include additional details when necessary to illustrate abutting adjacent buildings and important or unusual features. All

horizontal dimensions shall occur on the plans and vertical dimensions on the sections and elevations.

g. Room Finish Schedules

Include signage.

h. Door, Window, and Louver Schedules

Door schedule shall include door and frame types and references to door details and hardware sets. Window and louver schedules shall indicate window and louver types, sizes, and references to details.

i. Fire Ratings

Clearly indicate wall ratings and fire hazards as required by the National Fire Protection Association Codes (NFPA). See Military Handbook MIL HDBK 1008C, particularly Section 2.1 Basic Criteria and Section 2.1.2 Partitions.

In addition to the wall rating criteria required by the Codes, provide a minimum of one-hour rated wall assembly around all Janitors Closets, Store Rooms, Mechanical and Electrical Rooms or Closets. Wall fire ratings shall be graphically shown by a continuous symbol or pattern within the wall on the reflected ceiling plan and/or on a Fire Protection/Life Safety Plan. When other functions coexist with the fire protection functions, their integration shall be clearly indicated with an analysis that describes how both functions will be served. Provide a separate, composite type floor plan which makes an accurate presentation of these various features and functions. By authorized written permission, where the building and features being shown are unusually simple, this information may be included on other drawings. Rated wall details shall include the design number of the testing laboratory certifying the rating.

j. Modular Design

Use modular design practices for the design of all masonry buildings or components of buildings. Dimensions shall be figured to whole or half-unit lengths (in increments of 100 mm) in order to reduce on-site cutting of masonry. Units less than 102 mm long shall be avoided.

k. Room and Door Numbering

The Room and Door Numbering system shall be consistent for all buildings designed under any one contract. Room numbering shall start at the main entrance and proceed clockwise around functional areas.

l. Facility Elevation

The elevation of the first floor shall be indicated as 100 000 mm (100 feet) and shall be a minimum of 300 mm above finish grade. Elevation for other floors, footings, etc., shall be related to this figure. Sea level elevations shall not be shown on the building drawings. Show elevations of the first floor above sea level on the grading plan (Civil).

m. Access to Utilities

All utilities within the building, such as piping, ductwork, and electrical work, shall be concealed in finished areas unless otherwise specified in the Program and Performance Requirements. Provide plumbing chases in toilet areas. Carefully figure the clear space above ceilings and the size

of chases to accommodate piping slopes and connections, ductwork crossovers, and fittings, HVAC piping and valve service spaces, and similar situations. Provide access to valves, cleanouts, etc. Space provided for utilities systems shall be adequate but not excessive.

3.8.5 Interior Design

Furnish Building Related Interior Design (SID) Package, including floor plans, finish and color schedules, interior design analysis, and sample/color boards, in accordance with SWD-AEIM, Chapter III, paragraph "Interior Design." SID refers to the building related exterior and interior finishes. On the floor plan(s), show furnishings that are not considered part of the Contract, such as Government-furnished, Government-installed items, by the use of dashed lines and designated as "Not-In-Contract" (NIC). Use the design analysis to explain the desired image or visual appearance of the interior of the facility.

3.8.5.1 Submittal Requirements for SID Notebooks (Color/Finish Sample Boards)

a. Furnish 4 sets of color/finish board(s) with attached samples of the proposed building-related finish materials mounted on 215 mm by 280 mm by 1.5 mm (8-1/2 inch by 11 inch by 1/16 inch) thick mat board in three-ring notebooks. Epoxy glue, hot-melt glue, or contact cement shall be used to attach samples; Scotch tape, double-backed tape, or rubber cement will not be acceptable. Heavy samples shall be mechanically fastened. Photographs or colored photocopies are acceptable only for illustrating furniture, furnishings, and art work; not for material and color samples.

b. The notebooks shall be labeled on the outside spine and front cover with the phase percentage, SID, project title and location, Contract number, date, and the Contractor's name and address.

c. Sequence and Content of SID Submittal

The sequence and content of SID Submittals shall be as follows:

- (1) Title Page.
- (2) Table of Contents.
- (3) Narrative of Interior Design Objectives.
- (4) Exterior Elevation Drawing.
- (5) Exterior Building Material Legend.
- (6) Exterior Building Material Color Board(s).
- (7) Room Finish Schedules.
- (8) Interior Color Placement Plan.
- (9) Interior Color Boards (according to color placement plan).

Each sample shall indicate color, texture, and finish; and, if patterned, shall be large enough to define full pattern. Samples shall be identified as to type of material, area of installation, manufacturer, and transmittal number under which certification of the

material represented will be submitted in accordance with the requirements of Section 01330 CONSTRUCTION SUBMITTAL PROCEDURES.

(10) Interior Floor Plan(s) And Furniture Layout, including an index keyed to the furniture, furnishings, and art work illustration sheets..

(11) Signage Location Plans(s).

(12) Interior Signage Color Boards.

(13) Not Used.

(14) Not Used.

(15) Not Used.

3.8.6 Structural Design

Drawings shall include foundation plans and details, floor framing plans for each floor when applicable, floor slab plans, and roof framing plans.

a. Show the location of all in-wall columns or pilasters.

b. Foundation and slab plans shall show the size and location of all foundation elements, such as foundation walls, grade beams and footings. Elevations for footings shall be indicated on the plan. Plans for slabs-on-grade and exterior stoop slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as equipment bases, heavy Lab equipments, isolated foundations and the in-slab electrical raceway, which affect the slab design.

c. The sizes, locations, and elevations of footings shall be shown.

d. Coordinate slab plans with the Electrical sheets and indicate the locations of in-slab electrical raceway trench ducts or similar items.

e. Show concrete slab-on-grade thicknesses and sections.

f. Show proposed treatment of special foundations and other unique or complex features and details.

g. Provide elevation views, sections, and details necessary to illustrate the design.

h. Roof framing plans shall show sufficient details to clearly indicate the type of framing system used, size, and spacing of members and their elevations.

i. Drawings shall include overall building plan dimensions, north arrows, and design notes.

j. Grid Systems, Dimensions, and Floor Elevations

Each foundation and slab plan and roof framing plan shall have an alpha-numeric grid system aligned with any in-wall columns or

pilasters, or with load bearing and non-load bearing walls, as applicable. The same grid system shall be used for all plan views. Each plan view shown shall have all necessary dimensions. On plan views, the dimensions shall define the location of grid lines, offsets, and all structural elements, as well as the overall sizes of the structure. The finish elevation of the floor slab shall be indicated as 100 000 mm (100 feet), and elevations for foundations, walls and roof members shall be referenced to this basic elevation.

k. Plan Sheets

(1) Foundation and Slab Plans

Foundation and slab plans shall show the size and location of all foundation elements, such as foundation walls, grade beams and footings. Elevations for footings shall be indicated on the plan. Plans for slabs-on-grade and exterior stoop slabs at building entrances shall show location and type of joints, slab thicknesses and reinforcing, elevation of slab surfaces, and any other design features, such as equipment bases, heavy Lab equipments, isolated foundations and the in-slab electrical raceway, which affect the slab design.

(2) Roof Framing Plans

Roof framing plans shall be provided for all parts of the structure. Plans shall show the size, spacing, and location of all roof framing members, their supporting in-wall columns, pilasters or walls, all auxiliary members such as bracing and bridging, and the size and location of all major openings through the roof. Plans shall show support system for satellite dishes.

l. Elevation Views, Sections and Details Sheets

Elevation views, sections, and details necessary to illustrate fully the design shall be provided. Some requirements peculiar to the various structural materials are described below.

(1) Concrete

Include elevation views as necessary, plus sections and details to show the outlines of concrete cross-sections, reinforcing bar arrangements, concrete cover for rebar, installation of embedded items, and joint construction. All lap splice and embedment lengths for reinforcing bars shall be clearly indicated on the drawings. A sill detail for each foundation condition at exterior and interior doors shall be provided.

(2) Masonry

Wall reinforcing shall be located and identified on plans, in section cuts, elevation views, or in schedules. When required, include structural elevations to clarify the construction requirements for masonry reinforcement, especially the reinforcement around wall openings. Listed below are some frequently required masonry details, most of which are shown in ICBO Bldg Code and SWD-AEIM. Details may be extracted from other sources and incorporated into the final drawings. Edit the details to reflect the specific requirements of this project.

(3) Structural Steel, Steel Joists, and Steel Decking

Structural steel connections shall be fully detailed and shown on the drawings. The anchorage of beams, trusses, joists, and steel deck to walls or other bearings, and the extra framing or reinforcement required at deck openings shall also be detailed. Notes, details, or schedules on the drawings shall indicate the steel deck attachment method to be used, and shall give the size and spacing for perimeter, side lap, intermediate supports and end lap attachments. Welded connections shall be detailed using standard weld symbols illustrated in AWS D1.1. All applicable weld sizes, spacing, types, contours, and finishes shall be shown.

(4) Cold-Formed Steel Studs

Cold-formed steel connections shall be fully detailed and shown on the drawings. The anchorage of studs to top and bottom runners, of top and bottom runners to supporting members, and the extra framing at openings shall also be detailed. Notes, details, or schedules on the drawings shall indicate the steel stud and runner dimensions, spacing, and attachments.

m. Schedules

(1) Foundation Schedules

Foundation schedules for footings or grade beams shall be included as applicable. The schedule shall include all pertinent information required for the foundation system being used.

(2) Framing Schedules

For concrete framing, beam, and column schedules shall conform to the requirements of the ACI SP-66. For structural steel framing, provide a column schedule complete with design loads at splices, if any, and at column bases, plus a tabulation of the loads, shears, moments and/or axial loads to be resisted by the beams and their connections.

n. Equipment Loads

All equipment loads which exceed 80 kg and are not supported by concrete slab-on-grade, shall be identified on the drawings by showing equipment locations, total weights, and reaction loads at support points.

o. Notes

(1) Design Notes

Under the heading "Designer's Notes," the structural drawings shall contain notes which begin:

"The structural design was prepared using the following data:".

The data then listed shall include the structural loading criteria used for design, such as roof and floor live loads, snow load design parameters, wind speed and wind load design parameters, seismic design parameters (Zone Z, I, R_w, C, and S values), allowable soil bearing pressures (as recommended by the foundation analysis), foundation

design depth, design wind uplift pressures for steel joists and other data pertinent to future alterations. Also, to be listed are the ASTM designations and stress grades of the applicable structural materials: steel, masonry, concrete for each usage, reinforcing bars, and bolts.

(2) General Notes

Other notes, which direct the work to be performed, the materials to be used, etc., shall be grouped under the heading of "General Notes." Include in these notes a description of the building's structural system, if necessary.

3.8.7 Mechanical Design

Provide plans, piping diagrams and isometrics, mechanical room sections, water and air flow diagrams, details, schedules, control diagrams, sequence of operations, etc. as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Large-scale plans of congested areas shall be provided. Coordinate with architectural design for provision of access panels for all concealed valves, traps and air vents, etc. Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:50 (1/4 -inch = 1'-0") scale and shall show room names and numbers. Drawings shall include, but not limited to, the following:

a. Mechanical Abbreviation, Legend, and General Notes Sheet

This sheet shall include all mechanical abbreviations and symbols that will be used on the drawings. Include mechanical general installation notes that are required to clarify the construction intent that may not be readily apparent in the specifications or on the drawings. Symbols shall be grouped into sections; as a minimum, provide sections for Plumbing and HVAC. Control drawing symbols shall be shown on a separate drawing.

b. Plumbing Drawings

Plumbing Plans: Plumbing plans show show the design and layout of the domestic hot and cold water distribution systems; soil, waste and vent piping. Include routing of piping systems from the connections within the structure to a point 1.5 meters (5 feet) outside the structure. The grade of all drain lines shall be calculated and invert elevations established. All plans shall show plumbing fixtures. All electrical panels and equipment and pertinent HVAC equipment shall be outlined in half-tone on the plumbing plans. Plans may be drawn at 1:50 (1/4 inch = 1 foot) scale as long as legibility is not compromised. Plumbing fixtures and drains shown on the drawings shall be designated by the same identification system used in the Construction Specification Plumbing Fixture Schedule. Include the following:

(1) Enlarged bath room plans showing all fixtures, water, waste, and vent piping for each toilet area.

(2) Plumbing water and waste/vent riser diagrams for each wet area. Provide plumbing water and waste/vent riser diagrams for each wet area.

(3) Plumbing details and schedules.

c. Mechanical HVAC Drawings, Details, and Schedules

Show on mechanical HVAC drawings, all items of mechanical equipment to clearly illustrate all HVAC system designs, and to determine proper space allocation within the intent of the architectural layout requirements. Plans and sections shall be developed sufficiently to ensure that major equipment items, piping, and ductwork cause no interference with structural members, electrical equipment, etc. Provide Schedules for each item of mechanical equipment. Provide installation details showing specification requirements such as isolation and balancing valves, equipment pads, strainers, vents, hangers, and vibration isolation for each item of mechanical equipment. Include enlarged equipment room floor plans showing the layout of all HVAC equipment, piping, and ducts located within the rooms and dedicated access space for items requiring maintenance; and drawn at a minimum 1:25 (1/2 inch = 1'-0") scale. Provide equipment room sections to show equipment and components, ductwork connections and routing, and relationship to adjacent structural features. The following HVAC drawings shall be provided:

Mechanical HVAC Plans: Mechanical HVAC plans shall show the design and layout of the refrigerant piping, condensate piping, ground coupled heat exchanger piping, desuperheater piping, air supply and distribution systems, and ventilation and exhaust systems. Air supply and distribution systems shall show all ductwork, including supply and return mains, branch ducts, and takeoffs; ductwork to diffusers; diffusers, grilles, and registers.

3.8.8 Electrical Design

Provide plans, single-line diagrams, details, and schedules as necessary to define the required design intent. Coordinate the electrical and communications design with the design for other disciplines. Floor plans shall use the architectural floor plans as a basis with the building outline half-toned. Unless otherwise indicated, all floor plans shall be drawn at a minimum 1:50 (1/4-inch = 1'-0") scale and shall show room names. Site plans shall use civil site plans as a basis with all none electrical and communication items half-toned. Scale shall match that used for the grading plan. Include the following as applicable:

- a. Electrical Abbreviations and Legends
- b. Drawing Notes
- c. One-Line Diagram

Detail the complete electrical system with a simplified one-line diagram. The diagram shall show ratings of major equipment including short circuit ratings. Use standard symbols for electrical equipment including, but not limited to, sectionalizing cabinets, transformers, and panel boards. Include circuit breaker ratings; transformer ratings and connection configuration; panelboard current and ampere interrupting current (AIC) ratings; raceway and conduit sizes and material type; and conductor and ground type, size, and insulation ratings.

- d. Power Plan

Detail the electrical wiring for outlets, other than lighting. Identify

rooms by name.

e. Lighting Plan

Detail the electrical wiring and switching for lighting. Identify rooms by name.

f. Lighting Fixture Schedule

g. Panelboard Schedules

Detail the circuits and circuit breakers in panelboards. Panelboard schedules shall include the designation, location, mounting (flush or surface), number of phases and wires, voltage, capacity and total connected and demand load. Indicate the trip rating, frame size, interrupting rating, and number of poles for each circuit breaker in the panelboards. List the circuit number, circuit description, and load for each branch circuit. Include estimated maximum demand for each panel.

h. Site Plan

Detail the connection of pad-mounted sectionalizing cabinets. Show underground electrical and communications cables. Show utilities the underground electrical and communications ducts will cross. Communications design will be obtained from Southwestern Bell. (AM#2)

i. Communications System

Detail the home run wiring and other (AM#2) equipment required to support cable television and telephone.

j. Grounding System

Show location and detail for grounding electrode; grounding conductor and bond materials, and sizes.

k. Miscellaneous Details

Provide (AM#2) electrical manhole details, special light fixture details, etc.

3.8.9 Fire Protection Design

Provide plans, diagrams, sections, and details as necessary to define the required design intent. Floor plans shall use the architectural floor plans as a basis, with the building outline half-toned. Unless otherwise indicated, floor plans shall be drawn at a minimum 1:100 (1/8 inch = 1'-0") scale and shall show room names and numbers. Drawings shall include, but not limited to, the following:

Life Safety Plan

Show:

- location of fire separation walls, column, floor and roof protection,
- path of travel for emergency egress and panic exits,
- access to building for fire fighting,
- rated doors and windows,
- requirement for mechanical and electrical penetrations through

- fire separation walls and floors,
- placement of fire extinguishers, and
- occupancy types.

3.8.10 Environmental Design

Provide the following items and include response and annotated comments from preliminary design review for 100 % submittal:

Environmental Survey Sampling Plan for Abatement Items (if applicable)

Stormwater Pollution Prevention Control Plan

The Contractor shall submit for Government review and approval a project specific narrative or Detailed Storm Water Pollution Prevention Plan (SWPPP) or Erosion and Sediment control Plan developed in accordance with Section 01355 **ENVIRONMENTAL (AM#2)** PROTECTION, and Section 01421 OUTLINE OF A BASIC STORM WATER POLLUTION PREVENTION PLAN.

The Contractor shall also provide 2 final sets of corrected Erosion and Sediment Control Plans depicting types and location of control structures and provide Erosion and Sediment Control Structures and Details, Project Location and Vicinity Map as 1/2 size a stand-alone including 2 hard copies of SWPPP narratives.

Design Analysis

The Contractor shall reference above requirements for preliminary design submittal in 3.6.16 and prepare a Chapter in the Design Analysis entitled: "Environmental Protection Compliance". This Chapter shall summarize how the project complies with all environmental laws and regulations, and including signed pre-construction permit or notification forms or the final permit as attachment. As a minimum, the Chapter shall include the following:

- a. The Permitting and/or Approving Authority(ies).
- b. Construction/Operating Permits, Notices, Reviews and/or Approvals required. If, when checking with the agencies, a permit, notice or approval is not required, include a copy of the telephone conversation memorandum or letter from the agency.
- c. Time required by the permitting agency(ies) to process the application(s) and issue the permits.
- d. Fee schedule including filing/application fees, review fees, emissions fees, certification testing, etc.
- e. Monitoring and/or compliance testing requirements.
- f. Actual Environmental regulations governing the applications, exemptions, variances, etc. or at a minimum a brief summary of the regulation and title.

3.9 **ATTACHMENTS**

Attachments A, B, and C follow this page.

3.9.1 **ATTACHMENT A**

CODE ANALYSIS

UNIFORM BUILDING CODE (UBC) AND NFPA "LIFE SAFETY CODE" ANALYSIS

LIFE SAFETY AND FIRE PROTECTION IS AN INTEGRAL PART OF EVERY FACILITY DESIGN. RECOGNIZED CODES AND ACCEPTED SAFETY STANDARDS SHALL BE FOLLOWED IN THE DESIGN OF ALL FACILITIES. OF THE VARIOUS CODES AND SAFETY STANDARDS THE NATIONAL FIRE PROTECTION ASSOC. (NFPA) "LIFE SAFETY CODE" SHALL TAKE PRECEDENCE. ALL APPLICABLE REQUIREMENTS OF THE LIFE SAFETY CODE SHALL BE INCORPORATED INTO EACH DESIGN. FOR TYPE OF CONSTRUCTION, FIRE AREA LIMITATIONS, AND ALLOWABLE BUILDING HEIGHTS THE DESIGN SHALL FOLLOW THE UNIFORM BUILDING CODE (UBC).

CHECK LIST

PROJECT NAME _____ DATE _____
 LOCATION _____

3.9.1.1 UNIFORM BUILDING CODE ANALYSIS

a. OCCUPANCY CLASSIFICATION (See Table 5A):

Area:	Classification:
(GROUP: _____):	Div. _____
(GROUP: _____):	Div. _____
(GROUP: _____):	Div. _____

PRINCIPAL OCCUPANCY _____

OTHERS (SPECIFY) _____

b. TYPE OF CONSTRUCTION :

c. OCCUPANCY SEPERATION REQUIRED (SEE TABLE 5-B):

_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS
_____	TO	_____	=	_____	HRS

d. FIRE RESISTANCE OF EXTERIOR WALLS: (SEE TABLE 5-A)

NORTH _____

SOUTH _____
 EAST _____
 WEST _____
 OTHER _____

e. OPENINGS IN EXTERIOR WALLS: (SEE TABLE 5-A)

NORTH _____
 SOUTH _____
 EAST _____
 WEST _____
 OTHER _____

f. MAX. ALLOWABLE FLOOR AREA (SEE TABLE 5-C):

ALLOWABLE:

IF SPRINKLERED: _____

ALLOW. AREA INCREASES _____

CALCULATED ACTUAL FLOOR AREA:

Floor	Square Footage
-------	----------------

Totals:

g. MAX. ALLOWABLE HEIGHT (SEE TABLE 5-D):

METERS (FEET): _____

STORIES: _____

Proposed Height of Building: _____

Actual No. of Stories: _____

h. COMMENTS:

DESIGNER: _____

a. CLASSIFICATION OF OCCUPANCY:

HAZARD OF CONTENTS:

LOW

ORDINARY

HIGH

b. FIRE RESISTIVE REQUIREMENTS:

EXTERIOR WALLS: _____ HRS _____

INTERIOR WALLS: _____ HRS _____

STRUCTURAL FRAME: _____ HRS _____

VERTICAL OPENINGS: _____ HRS _____

FLOORS: _____ HRS _____

ROOFS: _____ HRS _____

EXTERIOR DOORS: _____ HRS _____

EXTERIOR WINDOWS: _____ HRS _____

BOILER ROOM ENCLOSURE _____ HRS _____

OTHER (LIST) _____ HRS _____

_____ HRS _____

_____ HRS _____

_____ HRS _____

c. MEANS OF EGRESS:

OCCUPANCY LOAD FACTOR: _____

OCCUPANCY	FACTOR	ACTUAL AREA	ACTUAL LOAD
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

d. NUMBER OF EXITS REQUIRED:

e. MINIMUM WIDTH OF EXITS:

CALCULATED: _____

ACTUAL: _____

f. MAXIMUM ALLOWABLE TRAVEL DISTANCE TO EXIT:

WITH SPRINKLERS: _____

g. EXIT DOORS:

MINIMUM WIDTH ALLOWED: _____

MAXIMUM LEAF WIDTH ALLOWED: _____

WIDTH REQUIRED FOR NO.OF OCCUPANTS: _____

h. EXIT CORRIDORS:

MAX. COMMON PATH OF TRAVEL: _____

MINIMUM ALLOWABLE WIDTH: _____

REQUIRED TO HAVE EXIT AT EACH END OF CORRIDOR?

DEAD END CORRIDORS ALLOWED? _____

MAXIMUM LENGTH: _____

WALL FIRE RESISTANCE REQUIRED: _____

DOORS & FRAME FIRE RESISTANCE REQUIRED:

i. STAIRS:

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MINIMUM WIDTH _____ FOR OCCUP. LOAD OF _____

MAX. RISER ALLOWED: _____

MINIMUM TREAD ALLOWED: _____

LANDINGS:

MIN. SIZE: _____

MAX. VERTICAL DIST. BETWEEN LANDINGS: _____

REQUIRED HEIGHT OF RAILINGS:

HANDRAILS:

REQUIRED AT EACH SIDE? _____

INTERMEDIATE RAIL REQUIRED? _____

HEIGHT ABOVE NOSING _____

INTERMEDIATE RAIL REQUIRED? _____

MAX. SPACE ALLOWED BETWEEN RAILS: _____

STAIR ENCLOSURE REQUIRED? _____

STAIR TO ROOF REQUIRED? _____

STAIR TO BASEMENT REQUIRED? _____

j. HATCHWAY ACCESS TO ROOF REQUIRED? _____

k. LADDER ACCESS TO ROOF REQUIRED?

l. HORIZONTAL EXIT REQUIREMENTS:

m. PROTECTION OF OPENINGS NEAR EXTERIOR STAIR EXIT DOORS:

n. SMOKEPROOF ENCLOSURE REQUIRED:

o. RAMPS:

MAX. SLOPE TO USE AS EXIT _____
HANDRAILS REQUIRED? _____

p. COMMENTS:

DESIGNER: _____

FOLLOWING IS A LIST OF ADDITIONAL "NFPA" CODES THAT ARE COMMONLY USED.
INDICATE WHICH OF THESE CODES ARE USED AND ADD THOSE REQUIREMENTS TO THIS
ANALYSIS.

NFPA 10	FIRE EXTINGUISHERS, PORTABLE
NFPA 75	COMPUTER/DATA PROCESSING FACILITIES
NFPA 80	FIRE DOORS AND WINDOWS
NFPA 88A	PARKING STRUCTURES
NFPA 409	AIRCRAFT HANGARS
AFM 88-4	DATA PROCESSING FAC. DESIGN AND CONST.
AF ETL 89-3	FIRE PROTECTION CRITERIA FOR ELECTRONIC

Typed Name and Signature of the
Licensed Architect/Engineer of Record
Professional Seal of the Licensed Architect/Engineer of Record

3.9.2 **ATTACHMENT B****ADA ARCHITECTURAL DESIGN CHECKLIST**

Project Name: _____

Project Location: _____

Design Phase: _____

ITEM

INCORP N/A

LATER

NO.

1. Established with the Base/owner of the facility the requirements for handicap accessibility. _____
2. Received a waiver for no handicap accessibility requirements on the facility. _____
3. Facility is designed utilizing:

New Construction Criteria	_____	_____	_____
Building Alteration Criteria	_____	_____	_____
Historic Building Preservation Criteria:	_____	_____	_____
4. Accessible Route (egress/corridors/halls/aisles).

- Provided minimum fire egress routes.	_____	_____	_____
- Provided minimum site accessible routes.	_____	_____	_____
- Provided proper clearance widths.	_____	_____	_____
- Provided proper floor level changes.	_____	_____	_____
- Provided proper floor materials.	_____	_____	_____
- Provided protection from protruding objects.	_____	_____	_____
5. Ramps:

- Maximum slopes less than 1:12	_____	_____	_____
- Maximum run less than 30 feet for 1:12 slopes	_____	_____	_____
- 40 feet for 1:16 slopes	_____	_____	_____
- Minimum clear width exceeds 914mm.	_____	_____	_____
- Provided proper edge protection.	_____	_____	_____
- Provided handrails of proper configuration and diameter.	_____	_____	_____
- Provided proper handrail extensions at top and bottom of ramp.	_____	_____	_____
- Provided handrails at proper mounting heights.	_____	_____	_____
- Provided proper landings.	_____	_____	_____
- Provided proper cross slope on ramp surface.	_____	_____	_____

ITEM
 INCORP
 N/A
 LATER
 NO.

6. Stairs:

- Protected the space below stairs from access by the blind. _____
- Provided handrails of proper configuration and diameter. _____
- Provided proper handrail extensions at top and bottom of stairs. _____
- Provided handrails at proper mounting heights. _____
- Provided treads greater than 280mm in width. _____
- Provided Proper nosings. _____

7. Elevators:

- Provided buttons and lanterns at the proper mounting height. _____
- Provided Braille characters. _____
- Provided proper door widths. _____
- Provided proper clearance inside elevator car. _____

8. Doors And Hardware:

- Provided proper door widths. _____
- Provided proper clearance on both sides of jambs. _____
- Entrance vestibules provided with adequate clearances. _____
- Provided levers on locksets and exit hardware. _____
- Provided closers with mechanical adjustments. _____
- Provided accessible thresholds. _____
- Provided protection plates on doors heavily used by wheel chair bound people. _____

ITEM INCORP NO.	N/A	LATER
-----------------------	-----	-------

- | | | | | |
|-----|--|-------|-------|-------|
| 9. | Toilet Facilities: | | | |
| | - Provided proper floor clearance through out the toilet rooms. | _____ | _____ | _____ |
| | - Provided minimum number of required accessible fixtures. | _____ | _____ | _____ |
| | - Provided accessible toilet stalls. | _____ | _____ | _____ |
| | - Provided stall doors with correct direction of swing. | _____ | _____ | _____ |
| | - Provided accessible water closets. | _____ | _____ | _____ |
| | - Provided grab bars at accessible water closets. | _____ | _____ | _____ |
| | - Provided grab bars with correct configuration and dimension. | _____ | _____ | _____ |
| | - Provided accessible sinks/lavatories. | _____ | _____ | _____ |
| | - Provided accessible urinals. | _____ | _____ | _____ |
| | - Provided accessible water coolers and fountains. | _____ | _____ | _____ |
| | - Provided accessible mirrors. | _____ | _____ | _____ |
| | - Provided accessible toilet accessories at required locations. | _____ | _____ | _____ |
| | - Provided all fixtures and accessories at proper mounting heights and clearances. | _____ | _____ | _____ |
| | - Provided insulated or protected exposed pipes at lavatories. | _____ | _____ | _____ |
| 10. | Shower/Tub Facilities: | | | |
| | - Provided the minimum number of accessible showers/tubs. | _____ | _____ | _____ |
| | - Provided showers/tubs with grab bars. | _____ | _____ | _____ |
| | - Provided showers/tubs with seats as required. | _____ | _____ | _____ |
| | - Provided controls mounted at the proper height and location. | _____ | _____ | _____ |
| | - Provided proper clearances and dimensions in showers/tubs. | _____ | _____ | _____ |
| | - Provided proper floor clearance through out shower/tubs rooms. | _____ | _____ | _____ |
| | - Provided doors with correct direction of swing and clearance. | _____ | _____ | _____ |

ITEM NO.		INCORP	N/A	LATER
11.	Storage:			
	- Provided accessible cabinets, shelves, closets, and drawers as required.	_____	_____	_____
	- Provided proper clearance, mounting heights, and reach provisions.	_____	_____	_____
12.	Telephones and Vending:			
	- Provided the minimum number of required accessible public telephones.	_____	_____	_____
	- Provided proper floor clearance around telephone.	_____	_____	_____
	- Phone and controls mounted at proper heights and within reach.	_____	_____	_____
	- Provided vending machines on an accessible route.	_____	_____	_____
	- Provided vending machines with accessible clearances and protruding object safe guards.	_____	_____	_____
13.	Fixed Or Built-in Seating And Tables:			
	- Provided the minimum number of accommodations for accessibility in areas which required fixed furniture.	_____	_____	_____
	- Provided proper floor clearance around furniture.	_____	_____	_____
	- Provide proper knee space at tables.	_____	_____	_____
	- Provided tables and counters with proper top surface heights.	_____	_____	_____
14.	Assembly Areas:			
	- Provided the minimum number of accessible seating spaces.	_____	_____	_____
	- Provided seating which is easily accessible to emergency egress.	_____	_____	_____
	- Provided companion seating.	_____	_____	_____
	- Integrated and dispersed accessible seating with the rest of the seating.	_____	_____	_____
	- Provided accessible dressing rooms.	_____	_____	_____
	- Provided level floor surface at accessible seat locations.	_____	_____	_____
	- Provided clear ground or floor space at accessible seat locations	_____	_____	_____
	- Provided access to all performing areas and associated spaces.	_____	_____	_____

ITEM NO.		INCORP	N/A	LATER
15.	Dining Halls And Cafeterias:			
	- Provided the minimum number of accessible dining spaces.	_____	_____	_____
	- Provided accessible counters and bars.	_____	_____	_____
	- Provided accessible aisles between tables or walls.	_____	_____	_____
	- Provided clear floor space at accessible dining locations.	_____	_____	_____
	- Provided accessible food service lines meeting minimum clearances and reaches.	_____	_____	_____
	- Provided accessible tableware and condiment areas.	_____	_____	_____
	- Provided raised speaker platform with protected edges.	_____	_____	_____
16.	Medical Care Facilities:			
	- At least 10% of the general patient rooms are accessible.	_____	_____	_____
	- Provided the number of accessible patient rooms as required for specialized treatment, long term care, or alterations of existing patient rooms.	_____	_____	_____
	- Provided at least one accessible entrance with weather protecting canopy or roof overhang.	_____	_____	_____
	- Provided minimum clearances within the patient rooms and around the beds.	_____	_____	_____
	- Provided accessible patient toilet/bath rooms.	_____	_____	_____
17.	Business And Mercantile:			
	- Provided at least one accessible sales counter, services counter, teller, information window, etc.	_____	_____	_____
	- Security bollards when provided, do not prevent access or egress to people in wheel chairs.	_____	_____	_____
18.	Libraries:			
	- Provided access to all reading and stack areas, reference reference rooms, reserve areas, and special facilities or collections.	_____	_____	_____
	- Provided at least 5% or a minimum of one of each element or fixed seating, tables, or study carrels as accessible	_____	_____	_____
	- Provided at least one lane of check out areas as accessible.	_____	_____	_____
	- Provided adequate clearance and reach distances at card catalogs and magazine displays.	_____	_____	_____
	- Provide stacks with minimum clear aisle width.	_____	_____	_____

ITEM NO.		INCORP	N/A	LATER
19.	Temporary Lodging:			
	- All common and public use areas are accessible.	_____	_____	_____
	- Provided accessible units, sleeping rooms, and suites.	_____	_____	_____
	- Provided sleeping accommodations for persons with hearing impairments.	_____	_____	_____
	- Provided a dispersed class and a range of room options.	_____	_____	_____
	- Provided accessible rooms in ADAL projects.	_____	_____	_____
	- Provided an accessible route to accessible sleeping rooms.	_____	_____	_____
	- Provided accessible clearance widths within sleeping rooms and around beds.	_____	_____	_____
	- Provided accessible doors within accessible sleeping rooms.	_____	_____	_____
	- Provided accessible fixed or built-in furniture and storage units.	_____	_____	_____
	- Provided accessible controls throughout accessible units.	_____	_____	_____
	- Where provided as part of an accessible unit each of the following were provided as accessible: living area, dining area, at least one sleeping area, patio/terrace, balcony, toilet/bath, and carport/garage/parking.	_____	_____	_____
	- Where provided as apart of an accessible unit, the kitchen, kitchenettes, wet bars, or similar amenities were also provided with accessible features.	_____	_____	_____
	- Provided visual alarms, notification devices, and accessible telephones.	_____	_____	_____
	- Provided accessible doors and doorways designed to allow passage into and within all sleeping units or other covered units.	_____	_____	_____

20. Transportation Facilities:

(This section covers Air, Rail, and Bus public transportation facilities. See Section 10 of the ADA Guide for specific requirements for these facilities)

3.9.3 ATTACHMENT C

MECHANICAL ROOM SIZE FORM

NOTE: Mechanical Systems Design Documents and Guides -
Mechanical Room Size Form

At the final design stage, the mechanical designer shall
fill out this Mechanical Room Size Form and include it in
the final design calculations.

The information submitted on this sheet shall be placed in a data base for
future use on similar DoD, COE project. (The data base shall be used to
help determine appropriate mechanical room sizes). Include this sheet in
the final design calculations.

Project:

Location:

Engineer:

Gross floor area of building:

Gross square footage includes (the entire building) stairs, corridors, etc.

Floor area of mechanical room:

Percent of gross building area is the mechanical room size:

Type of facility:

Sources of energy (E, G, S):

Mechanical equipment:

List of equipment outside the mechanical room and location:

Is the mechanical room too small?

Does the User think the mech room is too small? (Y, N, Don't know)

Additional remarks:

Abbreviations:

AC - air compressor
AHU - air handling unit
B - boiler
CU - air cooled condensing unit
DF - direct fired
DX - direct expansion chilled water heat exchanger

E - electric
FC - fan coil unit
FP - fire protection
G - natural gas or propane
HX - heat exchanger
LC - liquid chiller
MUA - make up air unit
UH - unit heater
ST - domestic hot water storage tank
S - steam

-- End of Section --

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

AM#5

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 Site Plan

The Contractor shall prepare a site plan indicating the proposed location and dimensions of any area to be fenced and used by the Contractor, the number of trailers to be used, avenues of ingress/egress to the fenced area and details of the fence installation. Any areas which may have to be graveled to prevent the tracking of mud shall also be identified. The Contractor shall also indicate if the use of a supplemental or other staging area is desired.

1.1.2 Identification of Employees

The Contractor shall be responsible for furnishing to each employee, and for requiring each employee engaged on the work to display, identification as approved and directed by the Contracting Officer. Prescribed identification shall immediately be delivered to the Contracting Officer for cancellation upon release of any employee. When required, the Contractor shall obtain and provide fingerprints of persons employed on the project. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

1.1.3 Employee Parking

Contractor employees shall park privately owned vehicles in an area designated by the Contracting Officer. This area will be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the military installation.

1.2 SANITATION

The Contractor shall provide and maintain within the construction area minimum field-type sanitary facilities approved by the Contracting Officer. Government toilet facilities will not be available to Contractor's personnel.

1.3 TELEPHONE

The Contractor shall make arrangements and pay all costs for telephone facilities desired.

1.4 PROTECTION AND MAINTENANCE OF TRAFFIC

During construction the Contractor shall provide access and temporary relocated roads as necessary to maintain traffic. The Contractor shall maintain and protect traffic on all affected roads during the construction

period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities having jurisdiction. The traveling public shall be protected from damage to person and property. The Contractor's traffic on roads selected for hauling material to and from the site shall interfere as little as possible with public traffic. The Contractor shall investigate the adequacy of existing roads and the allowable load limit on these roads. The Contractor shall be responsible for the repair of any damage to roads caused by construction operations.

1.4.1 Haul Roads

The Contractor shall, at its own expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Haul roads shall be constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided. The Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and hauling roads shall be subject to approval by the Contracting Officer. Lighting shall be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations. Upon completion of the work, haul roads designated by the Contracting Officer shall be removed.

1.4.2 Barricades

The Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.5 CONTRACTOR'S TEMPORARY FACILITIES

1.5.1 Administrative Field Offices

The Contractor shall provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

1.5.2 Storage Area

The Contractor shall construct a temporary 1.8 m high chain link fence around trailers and materials. The fence shall include plastic strip inserts, colored green or brown, so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Trailers, materials, or equipment shall not be placed or stored outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the military boundaries. Trailers, equipment, or materials shall

not be open to public view with the exception of those items which are in support of ongoing work on any given day. Materials shall not be stockpiled outside the fence in preparation for the next day's work. Mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment, shall be parked within the fenced area at the end of each work day.

1.5.3 Supplemental Storage Area

Upon Contractor's request, the Contracting Officer will designate another or supplemental area for the Contractor's use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but shall be within the military boundaries. Fencing of materials or equipment will not be required at this site; however, the Contractor shall be responsible for cleanliness and orderliness of the area used and for the security of any material or equipment stored in this area. Utilities will not be provided to this area by the Government.

1.5.4 Appearance of Trailers

Trailers utilized by the Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair. Trailers which, in the opinion of the Contracting Officer, require exterior painting or maintenance will not be allowed on the military property.

1.5.5 Maintenance of Storage Area

Fencing shall be kept in a state of good repair and proper alignment. Should the Contractor elect to traverse, with construction equipment or other vehicles, grassed or unpaved areas which are not established roadways, such areas shall be covered with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation shall be at the Contractor's discretion. Grass located within the boundaries of the construction site shall be mowed for the duration of the project. Grass and vegetation along fences, buildings, under trailers, and in areas not accessible to mowers shall be edged or trimmed neatly.

1.5.6 Not Used

1.5.7 Security Provisions

Adequate outside security lighting shall be provided at the Contractor's temporary facilities. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall notify the appropriate law enforcement agency requesting periodic security checks of the temporary project field office.

1.6 NOT USED

1.7 PLANT COMMUNICATION

Whenever the Contractor has the individual elements of its plant so located that operation by normal voice between these elements is not satisfactory, the Contractor shall install a satisfactory means of communication, such as telephone or other suitable devices. The devices shall be made available for use by Government personnel.

1.8 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, the Contractor shall furnish and erect temporary project safety fencing at the work site. The safety fencing shall be a 9 ga. chain link fencing, a minimum of 1.83 m high, supported and tightly secured to steel posts located on maximum 3 m centers, constructed at the approved location (AM#5). The safety fencing shall be maintained by the Contractor during the life of the contract and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.9 TEMPORARY HAZARD SAFETY FENCING

The Contractor shall furnish and erect safety fencing at temporary hazards and work site areas considered to be hazardous to the public. The safety fencing shall be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 1.1 m high, supported and tightly secured to steel posts located on maximum 3 m centers, constructed at the approved location. The safety fencing shall be maintained by the Contractor during the life of the hazard and, upon completion and acceptance of the work, shall become the property of the Contractor and shall be removed from the work site.

1.10 CLEANUP

Construction debris, waste materials, packaging material and the like shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Materials resulting from demolition activities which are salvageable shall be stored within the fenced area described above or at the supplemental storage area. Stored material not in trailers, whether new or salvaged, shall be neatly stacked when stored.

1.11 RESTORATION OF STORAGE AREA

Upon completion of the project and after removal of trailers, materials, and equipment from within the fenced area, the fence shall be removed and will become the property of the Contractor. Areas used by the Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition. Gravel used to traverse grassed areas shall be removed and the area restored to its original condition, including top soil and seeding as necessary.

1.12 MOWING

Grass and weedy vegetation within the areas utilized by the Contractor, including work areas, administrative areas, and storage areas, shall be kept mowed to control vegetative growth.

1.12.1 Mowing

Vegetation shall be mowed when it reaches a height of 150 mm. Mowing shall be to a height of 75 mm. Mowing shall be accomplished with a rotary mower that leaves the clippings evenly distributed on the soil surface. Mowing shall be accomplished during periods and in such manner that the soil and grass will not be damaged. Towed or self-propelled riding mowers shall not be operated within 1 meter of trees or shrubs. Areas adjacent to trees and shrubs shall be mowed with hand-propelled mowers.

1.12.2 Areas Not Mowed

Government may immediately after notice to the Contractor and at the discretion of the Contracting Officer mow the Contractor's areas at any time the vegetation height exceeds 150 mm.

1.12.3 Payment

No separate payment will be made for mowing as required under this section and all costs incurred by the Government for performing such work shall be deducted from the contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 15741

VERTICAL GROUND-COUPLED HEAT EXCHANGE SYSTEMS (VGCHES)

11/99

AM0005

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING
ENGINEERS (ASHRAE)Org

GHP-DG1

Ground-Source Heat Pumps, Design of
Geothermal Systems for Commercial and
Institutional Buildings. Latest edition.

AM0005

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1693	(1998) Environmental Stress-Cracking of Ethylene Plastics
ASTM D 2447	(1995) Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter
ASTM D 2513	(1998) Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D-2837	Hydrostatic Design Basis at 73.4 degrees F (23.5 degrees C) for the polyethylene pipe
ASTM D-2683	Socket Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing
ASTM D 3035	(1995) Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3261	(1997) Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D 3350	(1998a) Polyethylene Plastic Pipe and Fittings Materials
ASTM F 1055	(1998) Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled

Polyethylene Pipe and Tubing

INTERNATIONAL GROUND SOURCE HEAT PUMP ASSOCIATION (IGSHPA)

IGSHPA STD 2000

Closed-Loop/Geothermal Heat Pump Systems
Design and Installation Standards 2000

AM0005

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1

(1993) Rev 1; Rev 2; Rev 3; Rev 4) Motors
and Generators

1.2 COORDINATION OF TRADES

Pump supports, piping offsets, fittings, and any other accessories required shall be furnished as required to provide a complete installation and to eliminate interference with other construction.

1.3 DELIVERY AND STORAGE

All equipment shall be delivered and placed in storage with protection from the weather, humidity and temperature variations, dirt, dust, and other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

1.4 FIELD MEASUREMENTS

After becoming familiar with all details of the work, the Contractor shall verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing the work.

1.5 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. Submittals related to system configuration, heat transfer calculations, and equipment selection, including manufacturer's catalog data, connection drawings, control diagrams and certificates shall be submitted concurrently as a complete package. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings; GA AM0005

SD-03 Data; GA AM0005

Components and Equipment Data; GA.

Manufacturer's catalog data included with the VGCHES Installation Drawings for the following items. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with contract requirements for the following:

- a. VGCHES piping components, including recommendations for preparing joints using an electric heat fusion AM0005 process.
- b. VGCHES circulating pump(s)

deleted. **AM0005**

VGCHES Calculations; GA.

Calculations, submitted concurrently with the VGCHES Installation Drawings, demonstrating that the VGCHES will perform as specified.

SD-04 Drawings

VGCHES Installation Drawings; GA.

Drawings consisting of VGCHES layout including assembly and installation details and electrical connection diagrams; layout and installation details of circulation pumps, distribution manifolds and all piping, including points of connection to piping specified in other Sections, or heat pumps and other equipment shown on the drawings and to piping specified in related sections. Drawings shall include any information required to demonstrate that the system has been coordinated and will properly function within the HVAC system and shall show equipment relationship to other parts of the work, including clearances required for operation and maintenance and the test point locations where the VGCHES will be monitored during testing.

SD-06 Instructions

Test Procedures; GA.

Proposed test procedures, at least 2 weeks prior to the start of related testing.

System Diagrams; GA.

Proposed diagrams, at least 2 weeks prior to start of related testing. System diagrams that show the layout of equipment, piping, and circulation pumps, and typed condensed operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed.

SD-07 Schedules

On-site Training Schedule; GA.

Proposed On-site Training schedule, at least 14 days prior to the start of related training.

Hydrostatic Test; GA.

Proposed test schedule, at least 14 days prior to the start of related testing.

Performance Test; GA.

Proposed test schedule, at least 14 days prior to the start of related testing.

SD-08 Statements

VGCHES Designer; GA.

A letter no later than 14 days after the Notice to Proceed providing the name and Statement of Qualifications of the individual who will prepare the VGCHES Design and Calculations.

VGCHES Specialist; GA.

A letter not later than 14 days after the Notice to Proceed, providing the name and Statement of Qualifications of the individual who will serve as the VGCHES Specialist.

SD-09 Reports

Test Reports; GA.;

Test reports, signed by both the VGCHES Designer and the VGCHES Specialist, for the hydrostatic and performance tests in booklet form, no later than 14 days after completion of testing. Reports shall document all phases of tests performed including initial test summary, all corrections and adjustments made, and final test results.

SD-13 Certificates

Polyethylene Pipe Manufacturer's Fusion Installer Certificate; GA.;

Submit a pipe manufacturer's fusion installer certification for each person who makes heat fusion pipe joints in the field. Installer certification shall be issued by the manufacturer of the polyethylene piping used.

AM0005

VGCHES Installation Drawings and Calculations; GA.;

Concurrent with the submittal of VGCHES Installation Drawings and the VGCHES Calculations, submit certification by both the VGCHES Designer and the VGCHES Specialist that the VGCHES drawings and calculations have been coordinated with related work and will perform as specified.

VGCHES Design; GA.;

Concurrent with submittal of the VGCHES Installation Drawings, submit certification by the VGCHES Designer that the VGCHES design and calculations conform to all contract requirements, including signed approval of the VGCHES Test Reports.

VGCHES Installation; GA.;

Concurrent with submittal of the VGCHES Test Reports, submit certification by the VGCHES Specialist that the VGCHES is installed in accordance with the contract requirements, including signed approval of the VGCHES Test Reports.

SD-19 Operation and Maintenance Manuals

VGCHES Manuals; FIO.

Six manuals listing step-by-step procedures required for system startup,

operation, shutdown, and routine maintenance, at least 2 weeks prior to on-site training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis.]

1.6 VGCHES DESIGNER

The VGCHES shall be designed by an individual who is a registered professional engineer and is regularly engaged in the design of the type and capacity of system(s) specified in this project for the immediate three years prior to the submittal of the VGCHES Designer's Statement of Qualifications. The VGCHES Designer's Statement of Qualifications shall include data identifying the location, VGCHES type, and capacity of at least three systems designed by the proposed VGCHES Designer during that period. The Contractor shall furnish documentation from the owner of each of these three VGCHES verifying that each system has performed in the manner intended for the 6 months prior to submission of the Statement of Qualifications.

1.7 VGCHES SPECIALIST

Work specified in this section shall be performed under the supervision of and certified by the VGCHES Specialist. The VGCHES Specialist shall be a Certified as an "Installer" by the International Ground Source Heat Pump Association (IGSHPA) and shall be engaged in the installation of the type and capacity of the system(s) specified in this project for the immediate three years prior to the submittal of the VGCHES Specialist's Statement of Qualifications. The VGCHES Specialist's Statement of Qualifications shall include a copy of IGSHPA Installer Certification and data identifying the location, VGCHES type, and capacity of at least three systems installed under the guidance of the proposed VGCHES Specialist during that period. The Contractor shall furnish documentation from the owner of these three VGCHES verifying that each system has performed in the manner intended for the 6 months prior to submission of the Statement of Qualifications.

1.8 VGCHES CALCULATIONS

Heat transfer calculations shall be prepared by the VGCHES Designer using computer software specifically intended for VGCHES's. The design shall be based on calculations that will provide the most life cycle cost effective VGCHES using an expected life of 25 years and shall be sized based upon ground thermal conductivity as determined by a test well and conductivity test, loads determined by ASHRAE Residential Cooling Load Calculations method, and the nominal unit cooling tonnage selected. The total bore length shall not be less than the calculated feet per ton times the nominal tonnage of the unit selected. **AM0002** The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss, and the maximum expected expansion and contraction of the pipe shall be indicated in the program output. An accompanying schematic drawing showing reference points used in the calculations shall be included with the calculations. The maximum entering water temperature to the heat pumps under the peak air conditioning load design condition should not exceed 32 degrees C . The minimum entering water temperature to the heat pumps under the peak heating load design condition should be no lower than -1 degrees C . Adjacent

VGCHE will not be spaced closer than 6 m **AM0005**. The ground thermal conductivity test shall be as described in attachment 14. **AM0005**

1.9 DELIVERY AND STORAGE

Equipment placed in storage shall be protected from the weather, humidity and temperature variations, dirt and dust or other contaminants.

PART 2 PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

2.1.1 Standard Products

Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.1.2 Nameplates

Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate permanently affixed to the item of equipment.

2.2 VGCHES PIPING COMPONENTS

VGCHES piping terminates at the point shown on the drawings. The connecting piping shall be as specified in Section [_____].

2.2.1 Pipe

Piping and heat-fused materials shall be manufactured from virgin polyethylene and an extrusion compound material conforming to ASTM D 2513 with PE345434C or PE355434 cell classification with an ASTM D 3350 Class C, D, or E UV stabilizer, with the exception that the material shall exhibit zero failures (FO) when tested for 192 hours or more in accordance with ASTM D 1693, condition C as required in ASTM D 3350. Pipe shall be manufactured as specified in ASTM D 2447 Schedule 40 or ASTM D 3035 or ASTM D 2837 with a standard dimension ratio (SDR) of 13.5 for pipe diameters ranging from 32 mm and less to 75 mm, and a minimum SDR of 17.0 for pipe diameters 75 mm and greater.

2.2.2 Fittings

Butt and sidewall fittings shall be polyethylene and conform to ASTM D 3261 Socket fittings shall conform to ASTM D 2513 or ASTM D 2683; electrofusion fittings shall conform to ASTM F 1055. Socket fusion fittings shall conform to Barbed fittings and hose clamps shall not be used.

2.3 ELECTRICAL WORK

Electrical motor-driven equipment shall be provided complete with motor, motor starter, and controls. Electrical service shall be provided for all items recommended by the VGCHES manufacturer to meet the requirements specified herein. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall conform to Section 16415 ELECTRICAL WORK, INTERIOR. Electrical characteristics and enclosure type shall be as shown. Unless otherwise indicated, motors of 745 W and above

shall be high efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall conform to NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Any manual or automatic controls, protective or signal devices, and corresponding wiring required for VGCHES operation shall be provided. Where two-speed or variable-speed motors are indicated, solid-state variable-speed controller may be provided to accomplish the same function. Solid-state variable-speed controllers shall be utilized for 0.745 kW through 7.45 kW ratings. Adjustable frequency drives shall be used for larger motors.

2.4 CONTROLS

Controls for the VGCHES shall be integrated with the HVAC system controls package specified in Section [15950 HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS] [15951 DIRECT DIGITAL CONTROL FOR HVAC]. VGCHES controls shall be designed in accordance with the manufacturer's recommendations and to comply with the sequence of controls shown on the drawings.

PART 3 EXECUTION

3.1 VGCHES PIPING INSTALLATION

Piping components shall be joined by a heat fusion method that conforms the piping manufacturer's recommendation for this application.

3.2 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS, except that thermally enhanced grouts shall be used where indicated on the approved VGCHES Installation Drawings.

3.3 FIELD PAINTING AND FINISHING

Field painting and finishing are specified in Section 09900 PAINTING, GENERAL.

3.4 TESTING, ADJUSTING, AND BALANCING

Testing, adjusting, and balancing shall be as specified in Section 15990 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS. Testing, adjusting, and balancing shall begin only when the entire HVAC system, including controls, has been completed with the exception of performance tests. The VGCHES shall be charged with premixed propylene glycol solution (type and concentration as specified by the VGCHES Designer) prior to testing, adjusting, and balancing.

3.5 VGCHES TESTS

3.5.1 Hydrostatic Test

The VGCHES piping shall be isolated from all connections to piping specified in and shall be flushed of all dirt and debris using potable water flowing at a minimum velocity of 3 feet per second for a minimum of one hour or until no dirt or debris is visible, whichever is greater. The VGCHES piping shall then be plugged or capped as necessary in preparation

for the hydrostatic test(s). The piping shall be pressurized to 1000 kPa and monitored for a period of 2 hours. If there visible leakage during this period, the leak shall be identified and repaired in accordance with the piping components manufacturer's recommendations. Test shall be repeated until there are no leaks during the test period.

3.5.1.1 Vertical Well Piping

Each U-bend assembly shall be flushed (minimum velocity of 3 feet per second), filled with water and pressure tested to 125 PSI prior to insertion. Once pressure testing is complete, loop pipe ends are to be sealed to prevent the entry of foreign materials.

3.5.1.2 Horizontal Buried Piping

Horizontal header piping is to be installed no less than 3 feet deep. The header piping shall be flushed at 3 feet per second for minimum of one hour. Once all wells have been connected to the header, the entire assembly is to be flushed (minimum 3 feet per second) for 2 hours, filled with water and leak tested at 125 PSI. Once leak testing is complete, the header pipe ends are to be sealed to prevent the entry of foreign materials.

3.5.1.3 Interior piping

Interior piping shall be tested and flushed prior to final connection to buried well field piping. Flushing of interior piping shall be accomplished with full sized by-pass lines at each unit. Upon completion of flushing operation, final connections to units and well field will be made and the entire system shall be filled and then circulated until all air has been removed from the system. The system will be leak tested to 125 psig and checked for visible leaks.

3.5.2 Performance Test

Test(s) shall be repeated in entirety until results are considered satisfactory by the VGCHES Designer. Test shall be conducted by the VGCHES Specialist. All items required to perform the tests and all instruments required for tests shall be furnished by the Contractor. The accuracy of test instruments shall be as specified in Section 15990 TESTING, ADJUSTING AND BALANCING OF HVAC SYSTEMS. Test shall demonstrate that the entire system is functioning according to the Sequence of Operation [specified in Section [____]] [on the drawings]]. The operational test shall cover a period of not less than 72 continuous hours of operation using only system controls in normal mode. Supply and return VGCHES flow and temperatures shall be recorded at the locations shown on the VGCHES Installation Drawings for each VGCHES piping system at hourly intervals for the duration of the test period. In addition, weather conditions, including the ambient temperature and humidity in a shaded and weather protected area shall be recorded at hourly intervals. The report shall include calculations which will provide the capacity when operating during the peak design conditions listed on the drawings.

3.6 ON-SITE TRAINING

The VGCHES Designer shall conduct a training course for operating and

maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 16 hours (two 8 hours classes) of normal working time and shall start after the system is functionally complete but prior to the performance tests. The on-site training shall cover all of the items contained in the approved Operating and Maintenance Instructions.

-- End of Section --